Mining
CONGRESS JOURNAL
THE AMERICAN MINING CONGRESS
AUGUST
1946

Exide-Ironclad means . .

SAFE POWER

Exide-Ironclads are designed to meet the maximum safety requirements in today's mines. They assure not only safety, but also peak performance under all operating conditions . . . with economy, long-life and ease of maintenance.

Exide-Ironclads have . . .

the *high power ability* needed for frequent "stop and go" service

a *high maintained voltage* throughout discharge

the *high capacity* required to assure full shift availability

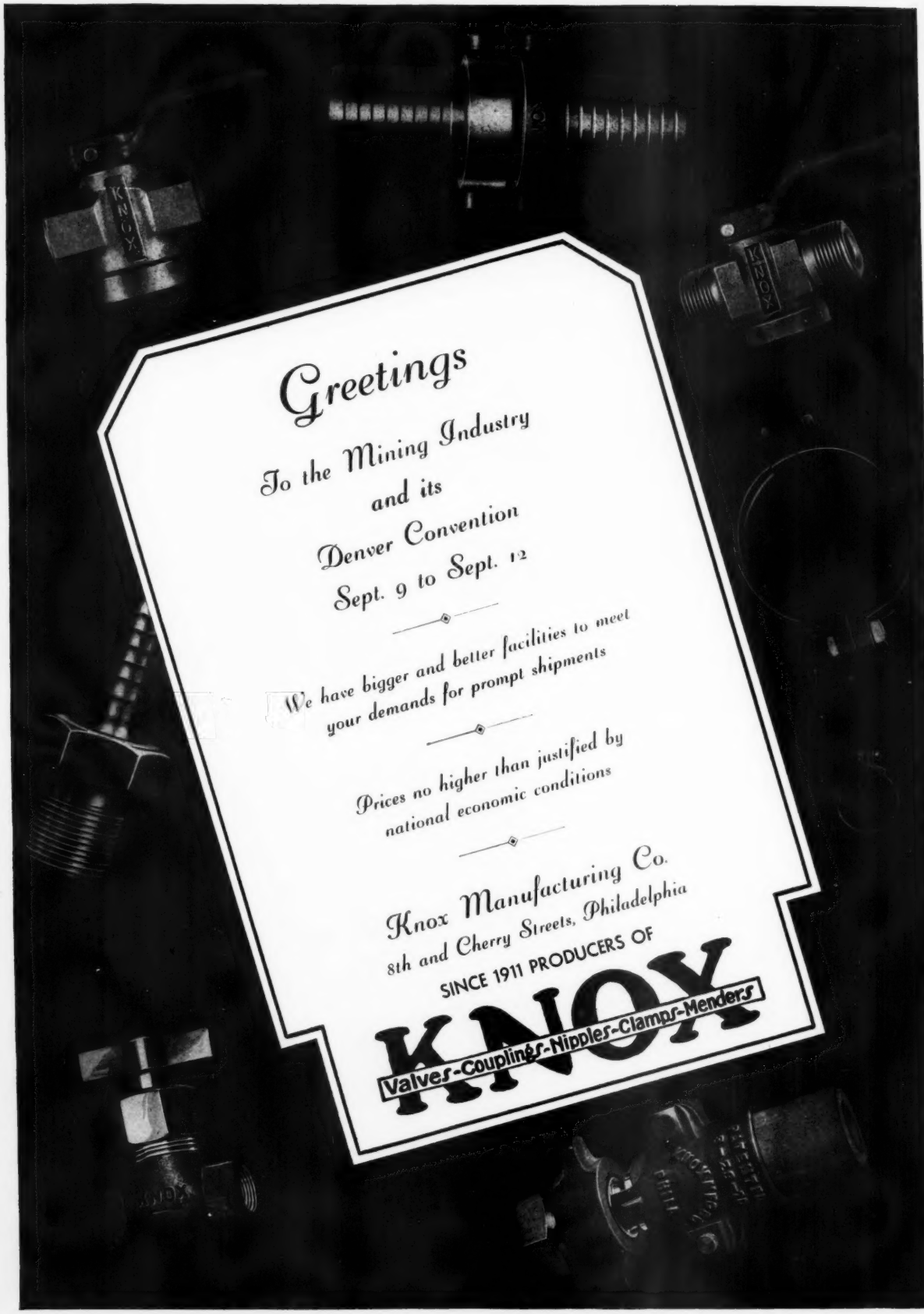
an *unusually long-life* providing a maximum battery economy day after day, year after year.

If you have a special battery problem, or wish more detailed information, write to Exide for booklet Form 1982.

•

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

★ If you have not yet read the U. S. Bureau of Mines circular I. C. 7328, be sure to get a copy from the Bureau of Mines, Washington, D. C.


Greetings
To the Mining Industry
and its
Denver Convention
Sept. 9 to Sept. 12
We have bigger and better facilities to meet your demands for prompt shipments
Prices no higher than justified by national economic conditions
Knox Manufacturing Co.
8th and Cherry Streets, Philadelphia
SINCE 1911 PRODUCERS OF
KNOX
Valves-Couplings-Nipples-Clamps-Menders

Mining CONGRESS JOURNAL

Contents

VOLUME 32, NUMBER 8 FOR AUGUST 1946

JULIAN D. CONOVER
Editorial Director

JULIAN W. FEISS
Editor

★

Associate Editors
A. W. DICKINSON G. B. SOUTHWARD
H. L. MOFFETT

Production
B. C. WILKERSON

Advertising
P. D. MCMURRER, Mgr.
FRANK W. MORAN (*Chicago*) RALPH F. DUYSTERS (*New York City*)
RALPH W. HARKER (*Los Angeles and San Francisco*)

★ ★ ★

Page

EDITORIALS 21

MAKING LOW-GRADE IRON ORE PAY 22
By A. J. WISELEY

CRIPPLE CREEK INCREASES PRODUCTION 25
By MARGARET GEDDES and KENNETH GEDDES

1946 METAL MINING CONVENTION AND EXPOSITION 37
Official Program 44
Exposition Preview 47

ELECTRIC EQUIPMENT FOR MODERN COAL PREPARATION PLANTS 57
By J. T. BAILEY

GOLD DREDGING IN CALIFORNIA 61
By H. A. SAWIN

VERTICAL TURBINE PUMPS FOR MINE USE 65
By FENMORE E. DUNN

TRAINING SUPERVISORS IN PREVENTIVE MAINTENANCE 74
By JOHN HARSANY

WHEELS OF GOVERNMENT 79

PERSONALS 81

NEWS AND VIEWS 83

MANUFACTURERS FORUM 94

Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

Copyright 1946, by
THE AMERICAN MINING CONGRESS
309 MUNSEY BLDG., WASHINGTON 4, D. C.

HOWARD I. YOUNG, *President* — DONALD A. CALLAHAN, *Vice President* — LOUIS S. CATES, *Vice President* — JAMES D. FRANCIS, *Vice President* — JULIAN D. CONOVER, *Secretary*

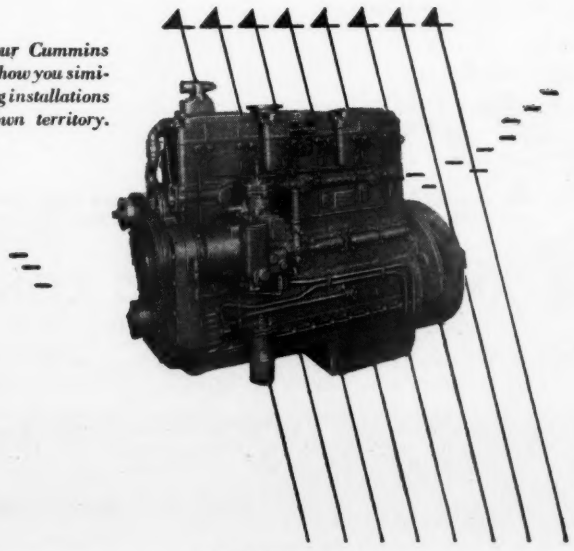
Published Monthly. Yearly subscriptions, United States, $2.00; Canada and Foreign, $4.00. Single copies, $0.20. February Annual Review Issue, $0.75. Entered as Second-Class Matter, January 30, 1915, at the Post Office at Washington, D. C.

ABC

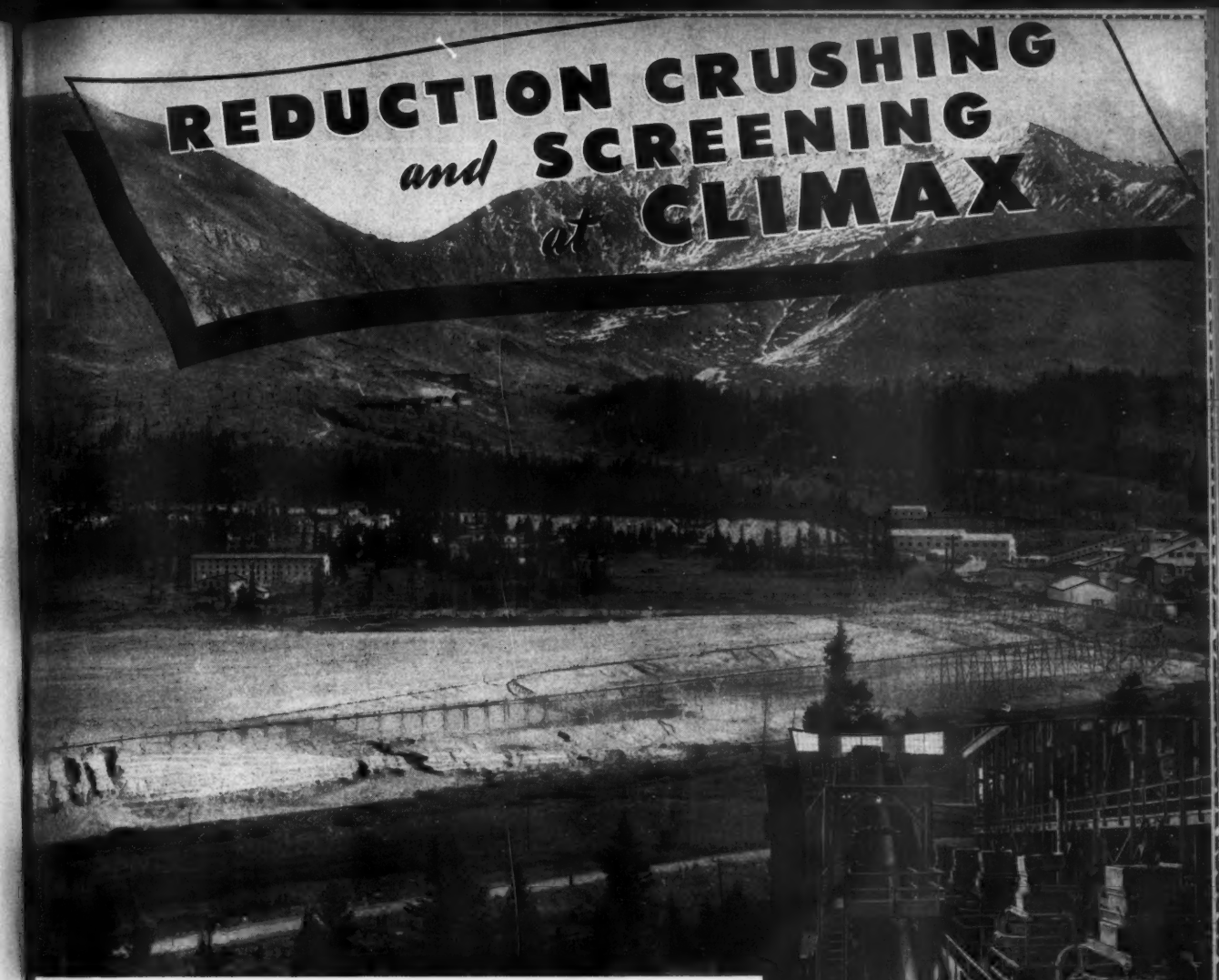
A sound investment in power . . . proved on countless jobs such as yours.*

CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

** Ask your Cummins Dealer to show you similar working installations in your own territory.*



REDUCTION CRUSHING *and* SCREENING *at* CLIMAX



In addition to these five 7 foot Short Head Cones, the No. 2 mill has two 7 foot Standard Cones located behind the far end of the conveyor.

One of twenty Symon Deck Screens installed at C These screens have long inch slotted openings o move the fines from th to the Short Head Cr

● High in Colorado's Rockies is this wonder mine of modern time — the world's greatest producer of molybdenum. At Climax Molybdenum Company, Symons Cone Crushers play a leading role just as they do at most of the world's important mines. When the No. 1 mill was built, a 7 foot Standard and two 7 foot Short Heads were installed. Later when more capacity was required, the No. 2 mill was added with two 7 foot Standard and five 7 foot Short Heads. These are set to crush to 3 mesh in closed circuit and are an essential link in maintaining the enormous production of this mine.

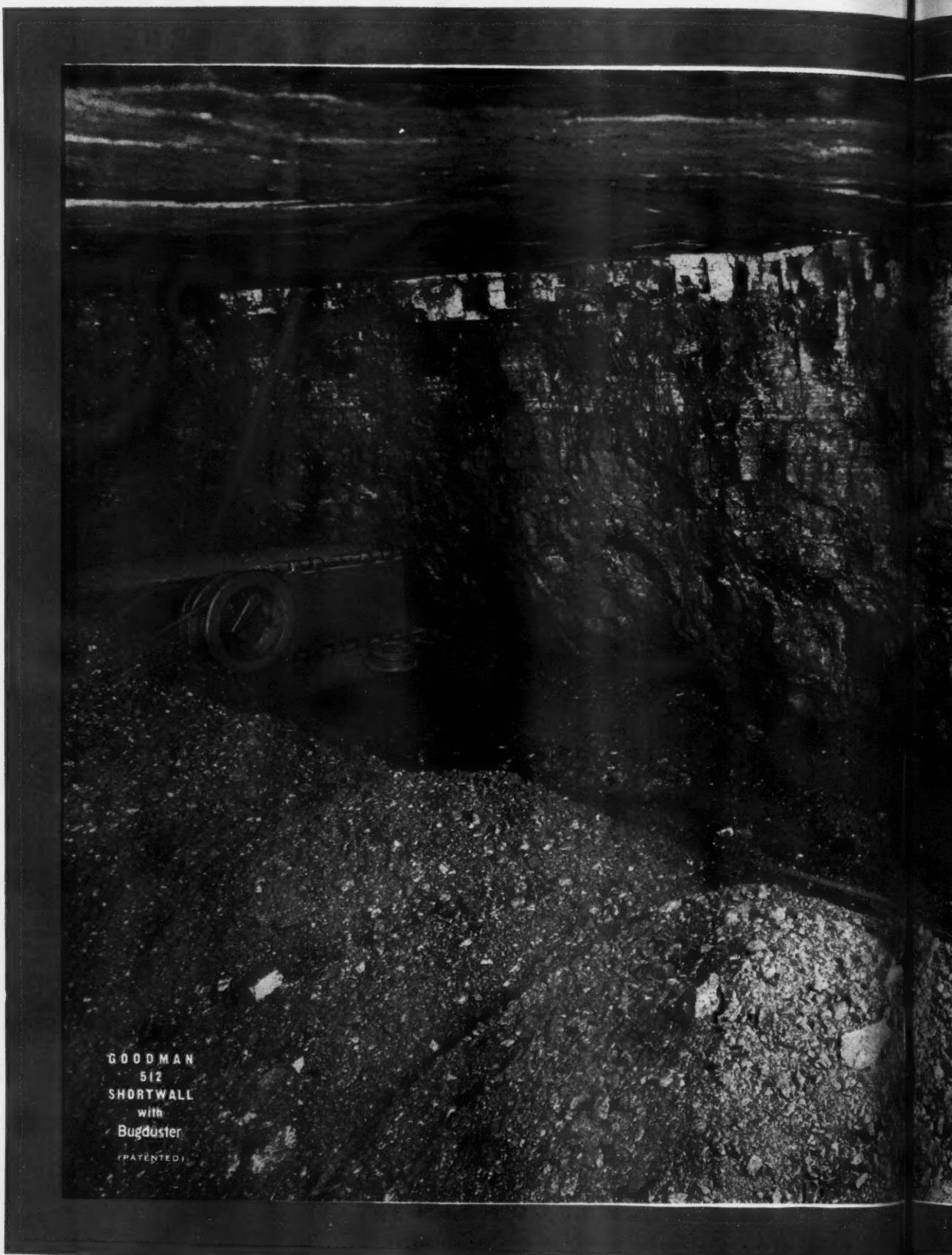
In addition to the Cone Crushers, Climax also has three 5' x 8' and seventeen 4' x 8' Symons Rod Deck Screens. The long slotted openings between the spring steel rods allow rapid discharge of the uniformly sized fine mill feed. The thorough removal of fines from the feed to the Short Head Cones in a large measure accounts for the enormous tonnage to these Crushers especially at the fine setting at which they operate.

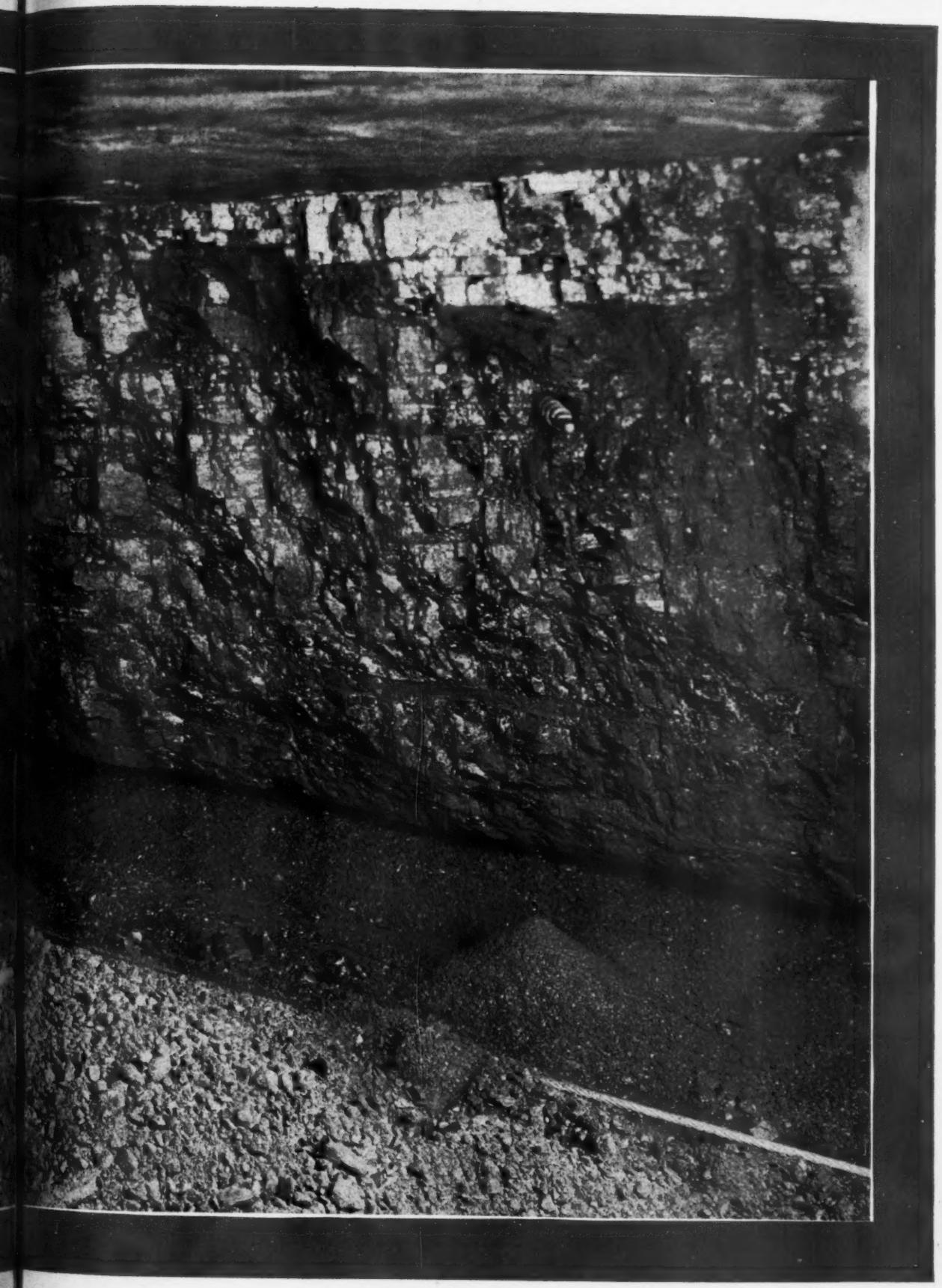
NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN

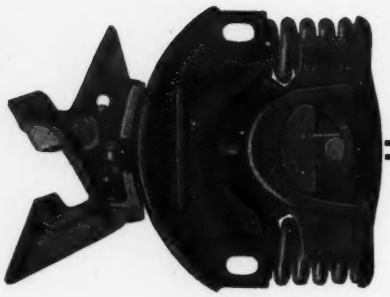
NORDBERG MACHINERY

NEW YORK • LOS ANGELES • WASHINGTON • LONDON • TORONTO • JOHANNESBURG

SYMONS CONE CRUSHERS


GOODMAN
512
SHORTWALL
with
Bugduster
(PATENTED)





DON'T FAIL to see our exhibit of modern mining equipment at the Metal Mining Convention & Exposition, September 9 to 12.

City Auditorium, Denver, Colorado
Booth No. 117

Willison Automatic Coupler Assemblies
for 4 and 8 Wheel Cars

NACO Steel Mine Car Wheels
Swivel Hitchings

NATIONAL MALLEABLE AND STEEL CASTINGS CO., CLEVELAND, OHIO

Sales Offices: Cleveland, New York, Philadelphia, Chicago, Richmond, St. Louis, San Francisco

Works: Cleveland, Chicago, Indianapolis, Sharon, Pa., Melrose Park, Ill.

HARDINGE *Equipment for the Mining Industry*

See Our Booth 418 at the
MINING CONGRESS
EXPOSITION
Denver, Colo., Sept. 9-12

HARDINGE products listed below are the outgrowth of the millman's demand for equipment that is simple, durable, and costs less to operate. New items which appear here are the result of a long development period which has proved their superiority for the purpose specified.

GRINDING MILLS—Conical Ball and Pebble Mills for wet or dry grinding in open or closed circuit; Rod Mills for minimum of oversize in open circuit grinding; Tube Mills for fine product in open circuit without classifier; Batch Mills for grinding or mixing; Thermomills, a combination of Conical Mills, Classifiers, Heaters; Unit Pulverizers for flash-roasting ores, grinding coal.

CLASSIFIERS—Counter-Current Classifiers for classifying, sizing, or counter-current washing. Hydro-Classifiers for fine sizes, accurate control of product, Reversed-Current Air Classifiers for dry materials for 20 to 325 mesh.

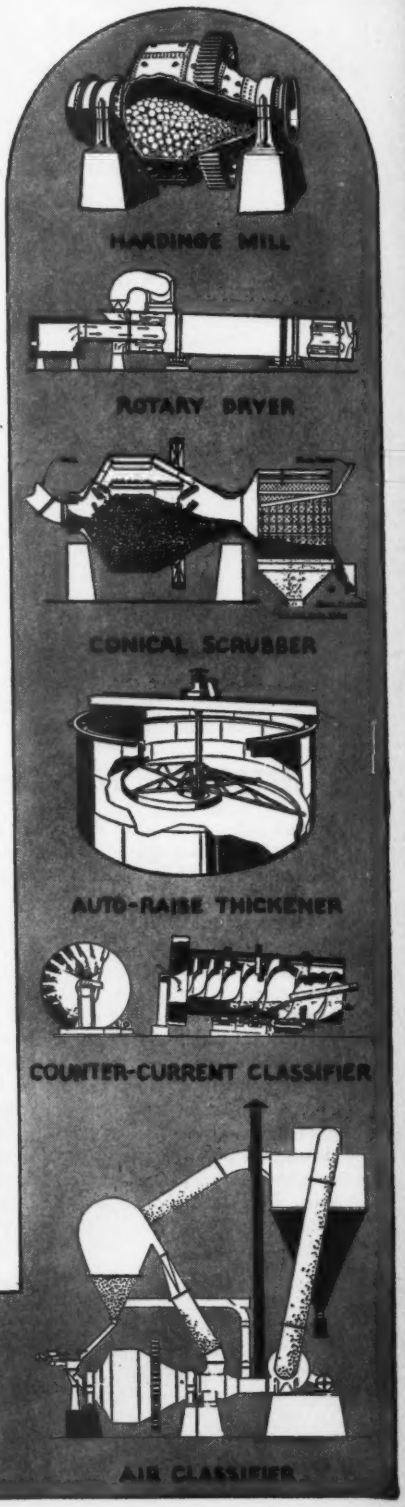
FEEDERS—Constant-Weight Feeders for handling products by weight, available as weight recording feeders and with various types of speed controls; Disc Feeders for bulky, sticky, or hot materials; Volumetric Feeders of pocket or belt type.

"ELECTRIC EAR" (Reg. U. S. Pat. Off.)—Controls feed by sound in mill, maintaining maximum capacity, uniform product.

RUGGLES-COLES DRYERS, KILNS, COOLERS — High-efficiency rotary dryers for drying all types of materials; Kilns, rotary type for drying, calcining, roasting or oxidizing; Coolers of the air, water, spray, or submerged rotary type.

THICKENERS, CLARIFIERS—With "Auto-Raise" driving mechanism which lifts scraping mechanism over any obstruction or overload. Tray Thickeners for successive thickening operations in one tank; Clarifiers in either circular or rectangular type.

OTHER PRODUCTS—Conical Scrubbers for cleaning by mass action; ABW Sand Filters with automatic backwash mechanism for influent water or final clarification of liquids; Agitators for mixing, agitating, or aerating metallurgical or chemical pulps; BLM "Auto-Centri" Clutch for reducing shock starting loads up to 5000 Hp.



HARDINGE
COMPANY INCORPORATED

YORK, PENNSYLVANIA — 240 Arch St. • Main Office and Works
NEW YORK 17—122 E. 42nd St. • 205 W. Wacker Drive—CHICAGO 6
SAN FRANCISCO 5—501 Howard St. • 200 Bay St.—TORONTO 1

INTERNATIONAL *Diesel Power—back of the blade—pushes through*

Where there's a mine there are roads to build and maintain. Open them up and keep them open with International Diesel Crawler Tractors to assure peak production.

International Diesels are forever busy around the mines. They remove overburden, move tailings, dig or shovel out the pay dirt, excavate and fill for construction. With power take-offs they do winching, hoisting, drilling and other such jobs.

Internationals do these things effectively and at new low cost. They have the stamina to stand up under punishing work on rough terrain. Their full-Diesel engines—that start as easily as equivalent gasoline engines—have the hang-on needed to push through when the going gets tough. Their excellent weight-to-horsepower ratio assures maximum traction. Perfect balance of tractor and matched equipment gives Internationals the stability for safety on steep grades.

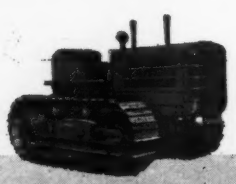
Maximum economy in the use of fuel, long-lived service, little down-time for repairs or maintenance and honest horsepower behind the blade, at drawbar or at take-off shaft is assured by International engineering throughout.

Yes, you'll be ahead with International Diesels—in lowered operating costs and more work accomplished. See the nearest International Industrial Power Distributor now for all the facts about International Crawler Tractors, Wheel Tractors and Power Units or Engines—and the new things soon to come from International Harvester.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue • Chicago 1, Illinois



TRACTRACTORS

POWER UNITS

WHEEL TRACTORS

INTERNATIONAL INTERNATIONAL HARVESTER **Industrial Power**

Welcome!

Greetings to all our friends attending the Metal Mining Convention and Exposition held by American Mining Congress.

This is the first full-scale meeting since before the war and will be one of the most beneficial of all times. The renewed opportunity for close cooperation between the leaders of mining and allied industries will be reflected in the future progress of metal mining. New and improved operating methods—new mine developments for the near future—the latest in equipment and machinery lines—these are but a few of the benefits that will be derived from this occasion.

Alloy Steel & Metals Company pledges itself to continue to develop higher efficiencies and economies in the equipment that will be a vital factor in the steady progress of the mining industry.

Other PACIFIC Products include—Manganese Steel Mill Liners • Manganese Steel Renewable Tractor Sprocket and Idler Wheel Rims • Crawler Shoes • Manganese Steel Crusher Jaws and other Wearing Parts.

New C-Type all Manganese Sheave Block

10 x 30 Pacific Jaw Crusher

Rock Bit Grinder

Pacific Slushing Scraper

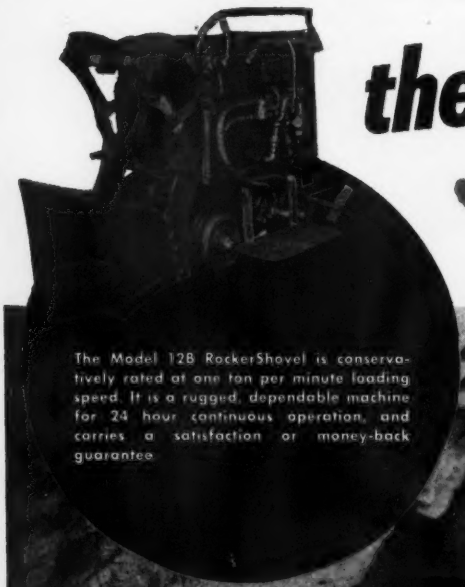
Alloy Steel and Metals Co.

1862 EAST 55TH STREET

Los Angeles 11 • California

The Model 12B RockerShovel in the Rainbow Tunnel

American Mining Congress



The Model 12B RockerShovel is conservatively rated at one ton per minute loading speed. It is a rugged, dependable machine for 24 hour continuous operation, and carries a satisfaction or money-back guarantee

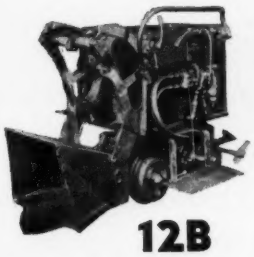
of the San Diego Aqueduct

The Rainbow Tunnel of the San Diego Aqueduct is one of a series of tunnels of the gigantic construction project to supply additional water to Southern California.

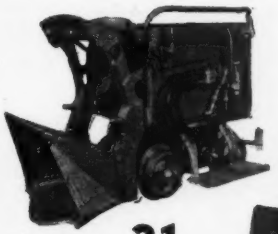
Eimco RockerShovels have again demonstrated their dependability in driving the Rainbow Tunnel. After each round has been drilled and blasted a Model 12B RockerShovel makes short, easy work of loading the muck.

At the time this picture was taken the tunnel had been advanced to 2350 feet with another 2450 feet to go. Each round advances the heading 6 feet and the daily average is approximately 25 feet.

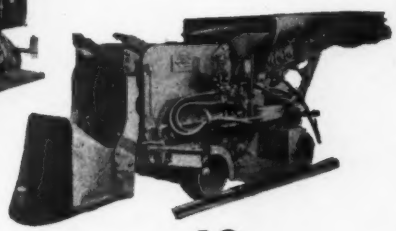
Low maintenance cost and ease of operation have made the RockerShovel a favorite with contractor and operator alike. These powerful, speedy Model 12B's do an efficient loading job for Miners and Contractors all over the world. Write for more information.



12B



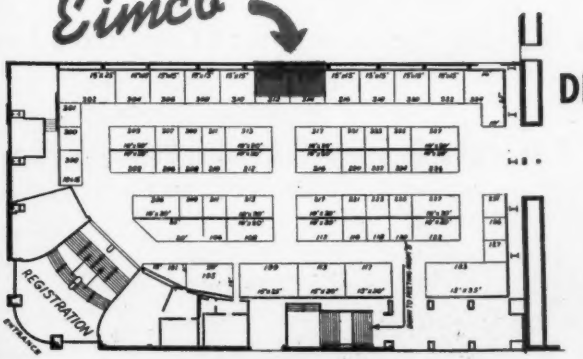
21



40

VISIT EIMCO'S BOOTH (312-314) AT THE *American Mining Congress*

Eimco



DENVER, COLORADO,

SEPT. 9-10-11-12

See!

OPERATING PICTURES

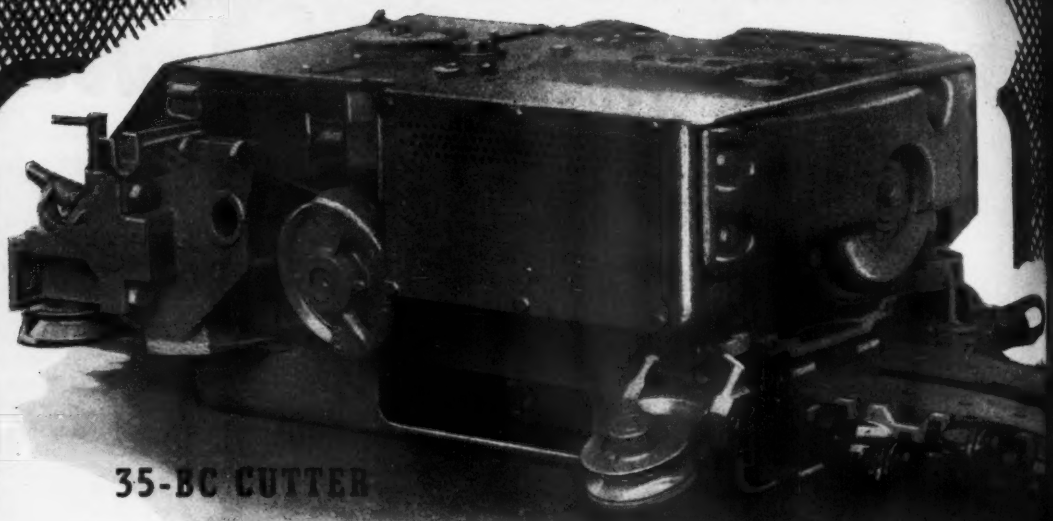
EIMCO ROCKERSHOVEL MODEL 21 IN THE LEADVILLE DRAINAGE TUNNEL

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturer of Underground Rock Loading Machines

Executive Offices and Factories — Salt Lake City 8, Utah: Branches — 67 Wall St., New York 5 — 111 W. Washington St., Chicago 2 — Mills Bldg., El Paso — 1217 - 7th St., Sacramento 14



35-BC CUTTER

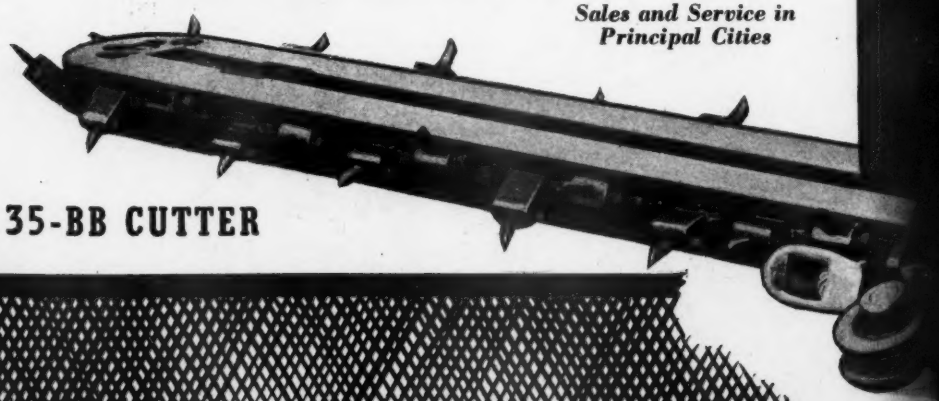
688-37

● These machines are of heavy, rugged construction for continuous underground duty. The independent operation of the feed and handling mechanism makes control flexible, permitting the machine to be sumped and the cut started across the face with one setting of the jacks. Jeffrey Shortwall Coal Cutters are designed to meet every requirement of shortwall mining. They are available for either A.C. or D.C. operation and as open or Government approved equipment.

The Jeffrey Manufacturing Co.

958-99 N. 4th ST., COLUMBUS 16, OHIO

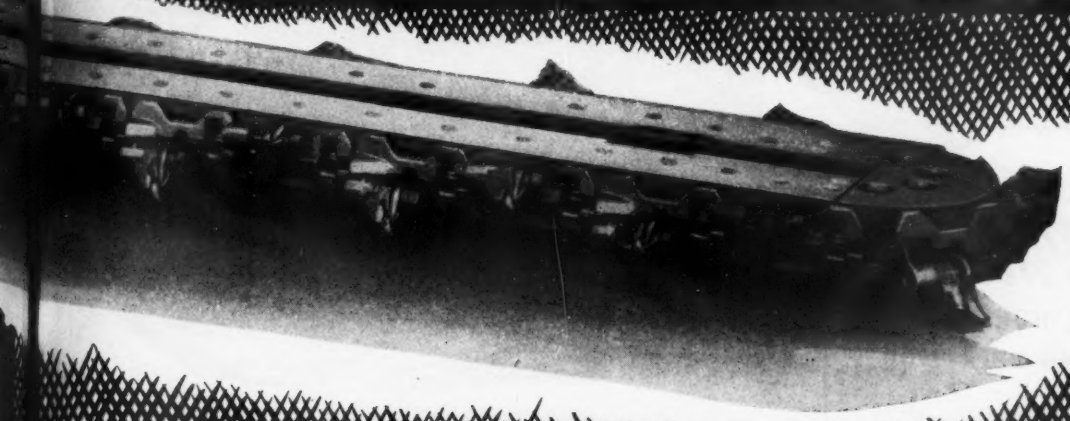
Sales and Service in Principal Cities

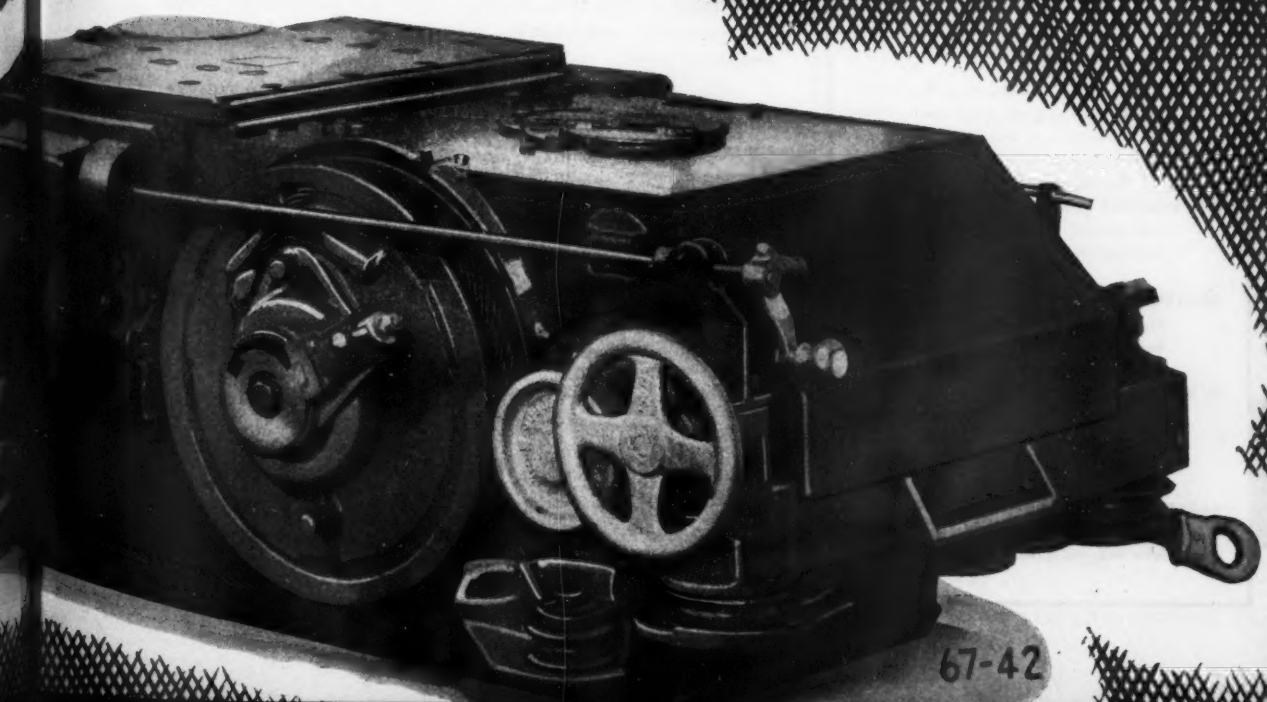


35-BB CUTTER

JEFFREY

Shortwall CUTTERS





67-42

Note THESE SUCCESSFUL HOUSING AND FEEDING OPERATIONS:

ANACONDA COPPER MINING CO.,
Darwin, California. 75-man camp; bunk houses, mess hall, commissary.

AMERICAN GILSONITE CO.,
Bonanza Mines, Utah. Bunk house, mess hall, commissary, general store.

BASIC MAGNESIUM PROJECT;
Las Vegas, Nevada. Housed 3600 men Mess hall, field cafeterias served 20,000 meals a day Complete recreation facilities.

FRUIT GROWERS SUPPLY CO.,
Lumber Town of 5000 people, Westwood, Lassen County, Calif. Restaurant, coffee shop, family style mess hall, recreation room, soda fountain, hotel.

MT. WHITNEY LUMBER CO.,
Johnsondale, Calif. Dormitories, mess hall, general store, commissary.

BOULDER DAM, NEVADA;
Fed 5000 men for 5 years. Modern laundry and dairy included in operation.

U. S. ARMY ENGINEERS;
Anchorage, Alaska. Complete subsistence service for 1200 civilian employees for 5 years.

PARKER DAM, ARIZONA-CALIFORNIA
1000-man camp, dormitories, commissary, mess hall and general store.

Well housed — well fed workmen...

are more *efficient* workmen. It pays to *keep* them happy.

H. S. Anderson Company does the *complete* "housekeeping" job for your mine crew. We design, equip and operate permanent or temporary mining, lumber and construction camps . . . stores . . commissaries . . . mess halls . . . cafeterias . . industrial hotels.

Our company has rendered this complete service to Western Industry—from Alaska to Texas—for the past 30 years. This long specialization places a proved organization at your service . . thoroughly trained administrative and supervisory staff . . . central purchasing offices . . . warehouse and personnel departments.

Apply this efficient "housekeeping" at your mine. Relieve yourself of the responsibility, time and effort required under present day conditions to conduct such operations.

Write telling us something of your requirements.
H. S. Anderson Company is ready to serve you . . . Well and Now.

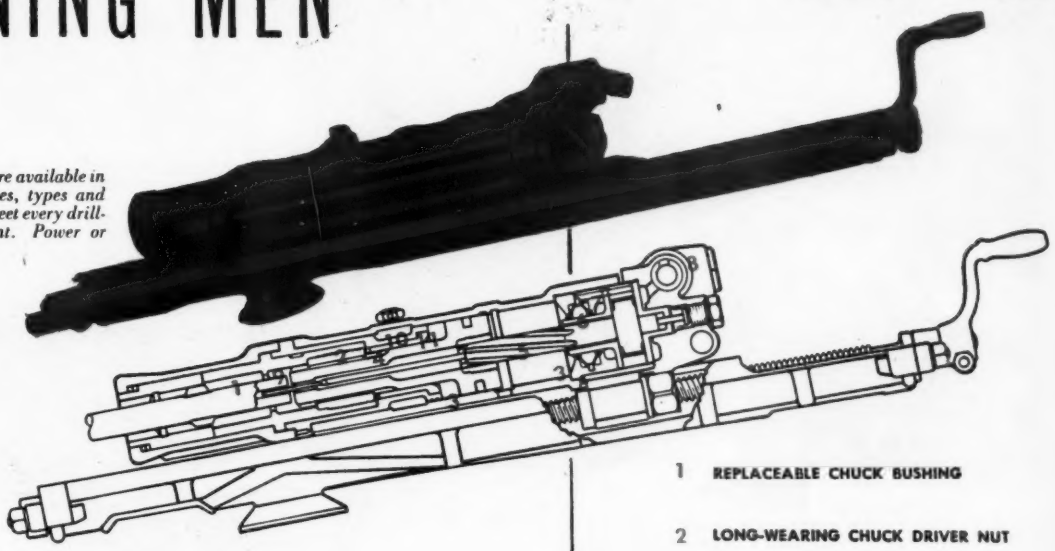
H. S. ANDERSON CO.

SUBSISTENCE CONTRACTORS FOR OVER 30 YEARS
303 BEASON BLDG. — SALT LAKE CITY
HOME OFFICE — 1063 GAYLEY AVENUE — LOS ANGELES 24

HOUSEKEEPERS TO THE NATION'S INDUSTRIES

WHY LEADING MINING MEN *specify* Thor DRIFTERS

Thor Drifters are available in a range of sizes, types and mountings to meet every drilling requirement. Power or Hand Feed.



1 REPLACEABLE CHUCK BUSHING

2 LONG-WEARING CHUCK DRIVER NUT

3 FULL AIR CUSHIONING

4 REPLACEABLE FRONT HAMMER BUSHING

5 EXTRA-HEAVY RIFLE BAR

6 SELECTIVE ROTATION SPEEDS

7 LIGHT-WEIGHT, SHORT-TRAVEL VALVE

8 POSITIVE THROTTLE CONTROL

9 EXCEPTIONAL HOLE CLEANING ABILITY

10 CONSTANT, AUTOMATIC LUBRICATION

11 PNEUMATIC PACKING

EXTRA FEATURES like these Reduce Maintenance and Cut Costs while assuring Peak Performance

LOOK at the outstanding design and construction features of this Thor Drifter Rock Drill. To the experienced operator, they spell drilling ability that means more "*bonus rods*" and to the Drill Doctor they spell new records in low-cost operation.

Built with the experience of fifty years of air tool making, Thor Rock Drills have *proved* their ability to increase footage in every kind of formation . . . and show amazing economy at the same time. Before you buy another rock drill, have *your* Drill Doctor check these Thor advantages. Then try a Thor on your property to see how it saves you time and money.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Boulevard, Chicago 6, Illinois
BIRMINGHAM BOSTON BUFFALO CLEVELAND DETROIT LOS ANGELES MILWAUKEE NEW YORK
PHILADELPHIA PITTSBURGH ST. LOUIS SALT LAKE CITY SAN FRANCISCO TORONTO, CANADA LONDON, ENGLAND

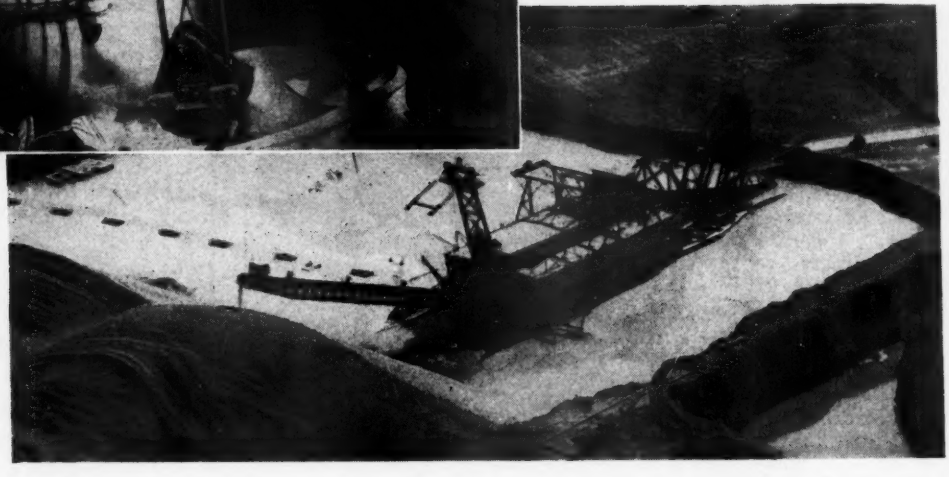
. . . Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

SPECIALIZED DREDGING . . . with a YUBA

Y.C.G.F. Dredge No. 20, Hammonton, California, uses 18 cu. ft. buckets and capable of digging 174 feet below ground level.

Changing bucket pins on Y.C.G.F. Dredge No. 20



Dredging for the recovery of metals or mineral products from placer deposits is not just a matter of earth moving, as many investors have learned to their sorrow. Quite the reverse—successful dredging is a specialized mining operation and the experience gained from many dredging fields must be considered and used in the design of a dredge to reasonably assure its profitable operation in a given area.

Essential field data can be determined prior to actual design and construction and after this is done, a dredge, specialized to accomplish its particular purpose, can be designed from the experience of other placer fields. In helping prospective dredge owners, Yuba can draw upon experience accumulated since the early days of modern placer dredging. If your plans include dredging for gold, tin, platinum or other mineral products, why not consult a company with expert knowledge of placer dredges and save time, avoid costly errors in design and secure sound advice based on many years of dredging experience.

YUBA MANUFACTURING CO.
351 California St., San Francisco 4, California, U.S.A.
AGENTS: Alluvial Dredges, Ltd., Renfrew, Scotland; London, England—Sime, Darby & Co., Ltd.
CABLES: Yubaman, San Francisco—Yardage, London

MINE car wheel requirements today are more severe than ever before. Heavier loads must be hauled at higher speeds!

a.C.f. mine car wheels are carefully designed to insure proper proportion of metal in the tread, flange, hub, plate and spokes—to secure maximum strength—with toughness—with durability—with an ample margin of safety!

Controlled heat-treatment in our manufacturing process produces "tough" wheels, with extra hard tread and flange surfaces—to give you those "extra miles" of wear—with less friction on the rails!

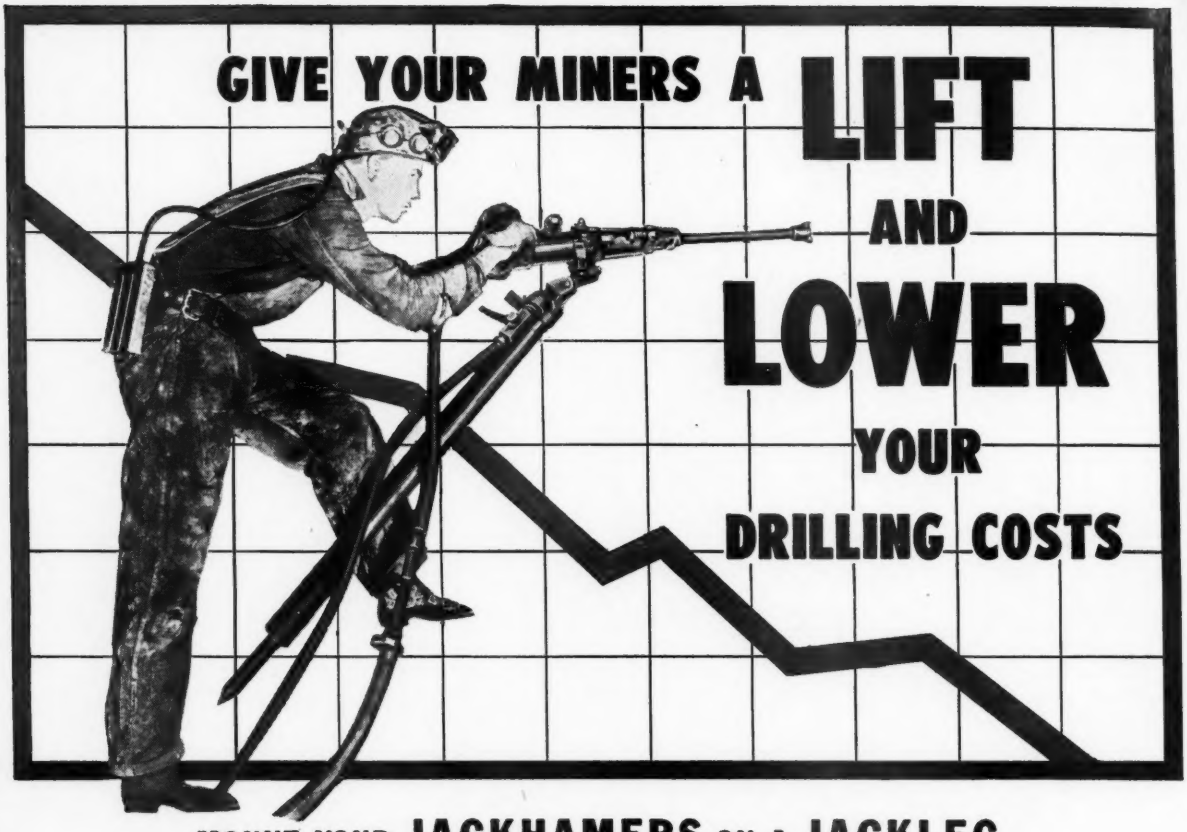
Mine car wheels are a vital part of your transportation system. They must be good to withstand today's service requirements.

Why not discuss your wheel problems with our Sales Representatives—soon? You'll be pleased with the performance of a.C.f. wheels!

a.C.f.

AMERICAN CAR AND FOUNDRY COMPANY, New York · Chicago · St. Louis · Cleveland · Washington, D.C. · Philadelphia · Pittsburgh · Huntington, W. Va. · Berwick, P

GIVE YOUR MINERS A LIFT AND LOWER YOUR DRILLING COSTS



MOUNT YOUR JACKHAMERS ON A JACKLEG

The Jackleg is an air-feed mounting that makes the drilling of horizontal holes with Jackhamers much easier. Miners have told us this, but we ran a test to determine exactly how much physical effort was saved.

The rock where this test was made required *104 pounds* feeding pressure to get maximum drilling speed out of a 55-lb. Jackhamer. The Jackhamer was then mounted on a Jackleg. The operator adjusted the conveniently located Jackleg feed throttle and pulled down on the Jackhamer handle with a force of only *11 pounds.* This means that in attaining maximum drilling results, he saved himself the work of holding up a 55-lb. drill and pushing it into the rock—*an expenditure of 11 pounds of energy as against 104 pounds.*

THERE ARE OTHER ADVANTAGES IN USING JACKLEGS, TOO:

✔ Drilling in all positions is much easier. (*Down holes* can be drilled by quickly removing the Jackhamer from the *Jackleg.*)

✔ Drill upkeep costs are reduced because the machine is properly held to the work. Chuck bushings and fronthead parts give longer service.

✔ Because the Jackleg both supports the drill and feeds it into the rock, heavier Jackhamers with faster drilling speed can be used for horizontal holes. Some mines have increased their footage as much as 50% by putting Jacklegs to work.

✔ Miners are happier with Jacklegs. The work is easier and they drill more footage per shift.

SO GIVE YOUR MINERS A LIFT . . . BUY A JACKLEG TODAY.
THE RETURNS ON YOUR INVESTMENT WILL BE LARGE

SEVENTY-FIFTH ANNIVERSARY

COMPRESSORS • AIR TOOLS • ROCK DRILLS
TURBO BLOWERS • CONDENSERS
CENTRIFUGAL PUMPS • OIL AND GAS ENGINES

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 5-876

Less weight....

TO SUPPORT IN BORE HOLES WITH ALCOA ALL-ALUMINUM FEEDER CABLE

For example

BARE ALCOA ALL-ALUMINUM CABLE, EQUIVALENT TO 500,000 CM. COPPER, WEIGHS ONLY 74.6 LBS. PER 100 FT.

You'll simplify the installation of feeder cables by using lightweight Alcoa All-Aluminum . . . easier handling, much less weight to support.

Alcoa All-Aluminum Cables long ago proved their worth in coal mines where acid corrosion exists. Installations made thirty-five years ago are still going strong.

AVAILABLE FOR PROMPT SHIPMENT

No need to delay the extension of your feeder lines. You can get shipment of Alcoa All-Aluminum Bare Cable in circular mil sizes to meet your needs.*

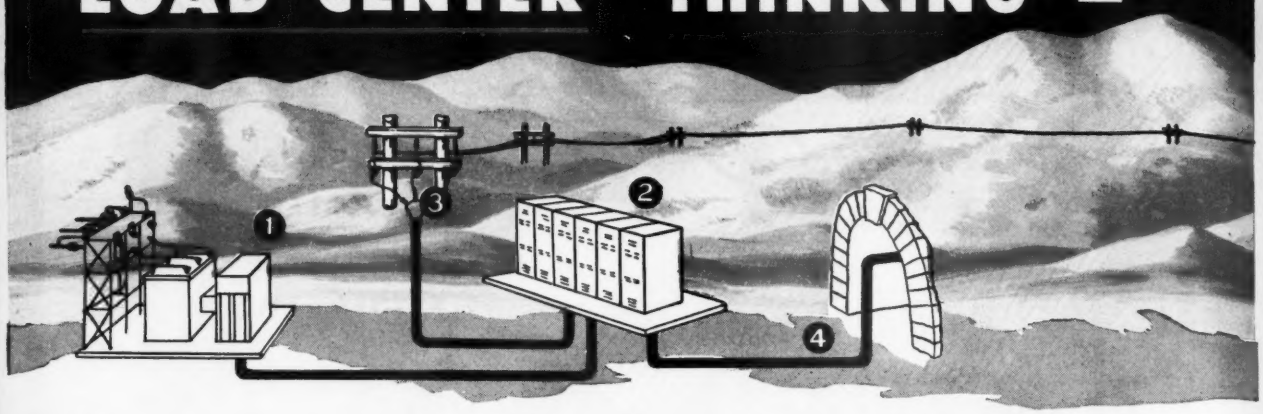
Complete data on these cables are available through the nearby Alcoa office. Or write ALUMINUM COMPANY OF AMERICA, 1764 Gulf Building, Pittsburgh 19, Pennsylvania.

***** *Alcoa does not manufacture insulated cable, but can have the insulation applied for you if that is required, and if you can allow the extra time.*

ALCOA FIRST IN **ALUMINUM**

IN EVERY COMMERCIAL FORM

LOAD CENTER "THINKING"—



Modernization of this mine's power system provides for

1—more efficient power utilization now!

2—more economical expansion in the future!

When the Bunker Hill & Sullivan Mining & Concentrating Company began to modernize the power system at their Bunker Hill mine, two methods were possible. Additional conductor capacity could be installed where needed. But this would eventually lead to a "shoestring" power system, liable to "snap" at any time. Or, power "handling" could be put on an economical, low-cost basis by expanding according to the load-center principle of power distribution.

Today, Bunker Hill's power system is an excellent example of how load-center "thinking" can achieve an over-all co-ordination in power system planning. Prime feature of the new layout is the carrying of high-voltage electric power miles underground to substations located close to the load. Numerous small strung-out distribution equipments have been replaced with large, modern units installed the load-center way. Present power requirements are met more efficiently. More important, there's ample room for future expansion.

Briefly, Bunker Hill profits from load-center power distribution in these important ways:

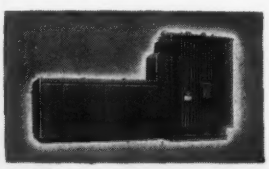
CONTINUITY OF SERVICE—There are no weak spots in power service. The possibility of a crippling breakdown for want of adequate power is remote.

STABLE VOLTAGE—Long, overloaded, low-voltage feeders are eliminated.

LOWERED COSTS—Over the years, load-center power distribution is less costly than piecemeal expansion. Additions to the system are made without making existing equipment obsolete.

LOWERED MAINTENANCE—The cost of repairing equipment damaged by undervoltage or overvoltage conditions found in obsolete power systems is negligible in a load-center power distribution system.

Before you make any additional investment in transformers, switchgear, or cable for piecemeal extensions or replacements in your power system, investigate the advantages of the load-center method. G-E engineers will be glad to help you develop a long-range plan of power distribution, one that will pay dividends for years to come. Call our nearest office. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



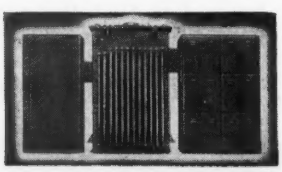
MASTER UNIT SUBSTATIONS

Completely metal-enclosed, these factory-assembled units are for systems handling incoming-supply voltages from 11 kv to 132 kv. Capacities range from 750 kva up to 25,000 kva. Used to supply load-center unit substations at voltages of 2.4 to 13.2 kv.

**Pyranol is General Electric's tradename (Reg. U. S. Pat. Off.) for non-sludging, non-inflammable insulating liquid.*

PRIMARY METAL-CLAD SWITCHGEAR

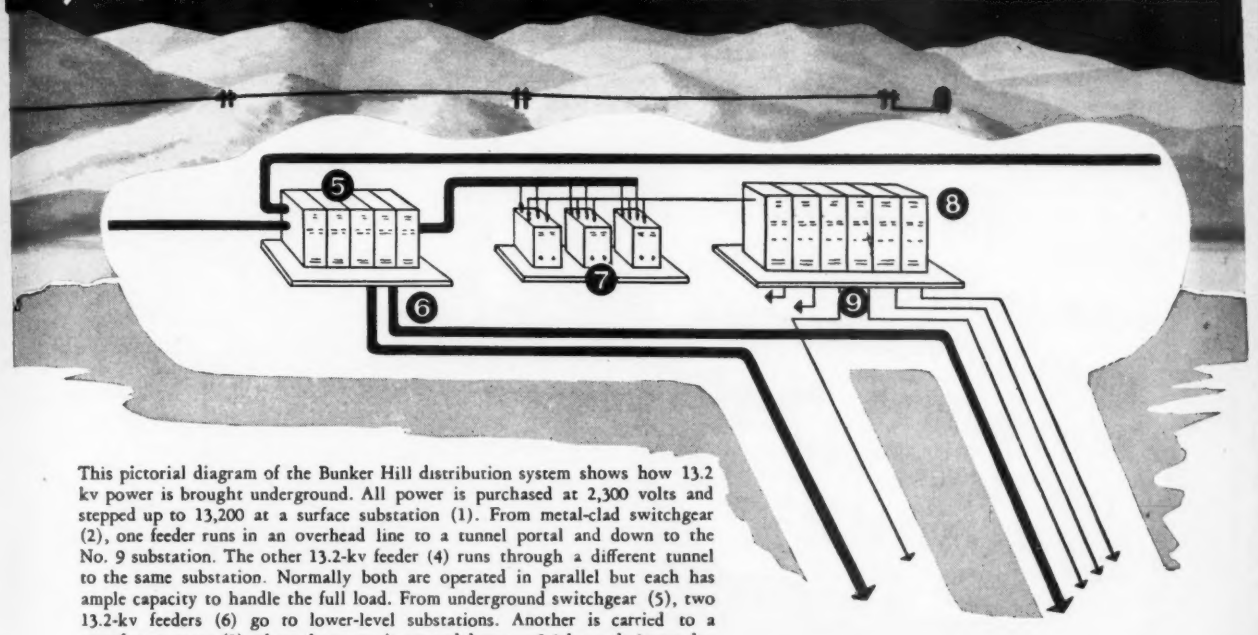
A central metal-clad switchgear installation may include all equipment necessary to handle incoming line and high-voltage feeder lines. Or, high-voltage circuit protection may be had at each unit substation with individual switchgear units. The magne-blast air circuit breakers with convenient vertical-lift construction are easy to inspect and maintain.



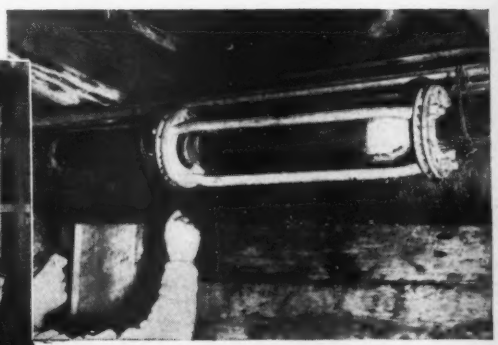
LOAD-CENTER UNIT SUBSTATIONS

Compact, fully-enclosed G-E load-center unit substations are furnished in flexible combinations of incoming-line and secondary-circuit arrangements from 100 to 2000 kva. Both dry-type and Pyranol*-filled transformers are available and are capable of handling emergency overloads as well as operating under unfavorable ambient-temperature conditions.

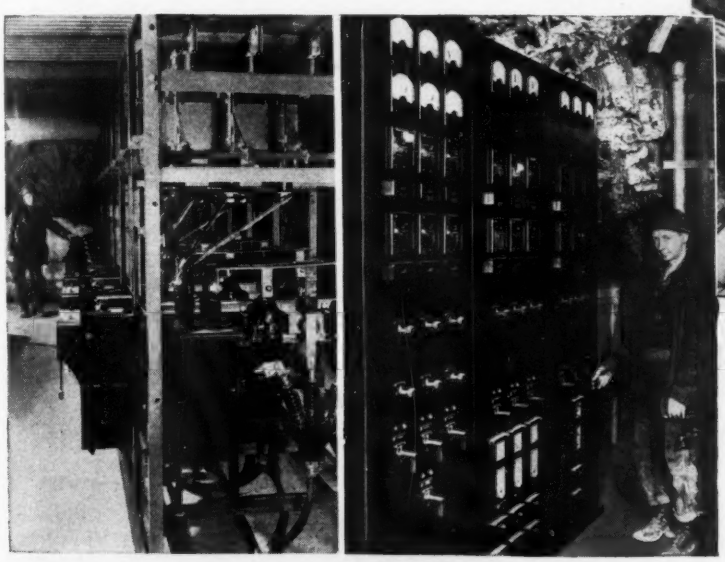
pays a double bonus AT BUNKER HILL



This pictorial diagram of the Bunker Hill distribution system shows how 13.2 kv power is brought underground. All power is purchased at 2,300 volts and stepped up to 13,200 at a surface substation (1). From metal-clad switchgear (2), one feeder runs in an overhead line to a tunnel portal and down to the No. 9 substation. The other 13.2-kv feeder (4) runs through a different tunnel to the same substation. Normally both are operated in parallel but each has ample capacity to handle the full load. From underground switchgear (5), two 13.2-kv feeders (6) go to lower-level substations. Another is carried to a transformer room (7) where the power is stepped down to 2.3-kv and thence distributed to lower levels through 2.3-kv switchgear (8) over 2.3 conductors (9).



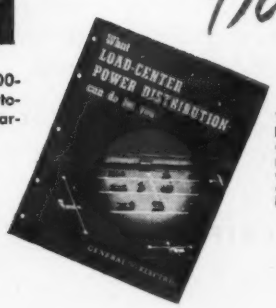
Cable splice with armor clamp on three-conductor 2/0, 13.2-kv underground cable at Bunker Hill and Sullivan mine.



BEFORE—Old-type open framework bus and switchgear in the Bunker Hill mine created safety hazards and maintenance problems.

AFTER—It was replaced with modern G-E 2300-volt metal-enclosed switchgear featuring easy-to-operate controls and smooth-dead front appearance.

Free!



LOAD-CENTER INFORMATION

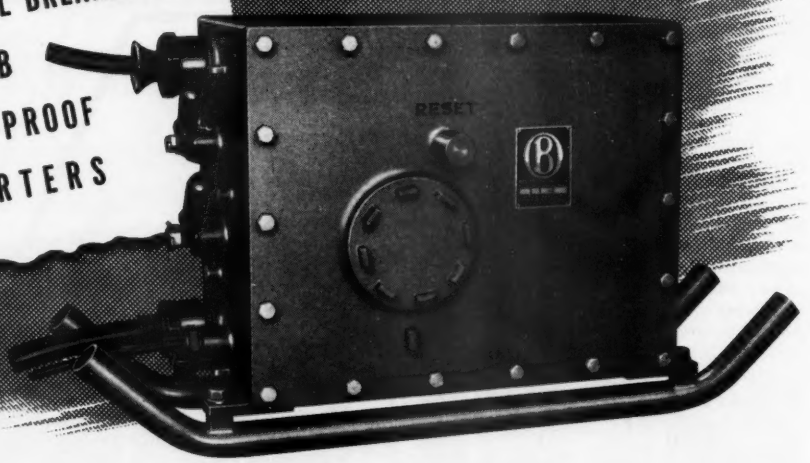
This informative bulletin discusses load-center power distribution completely, both in theory and in practice. It gives interesting data on costs, installation, equipment, etc. Send for your free copy of Bulletin GEA-3758B.

GENERAL ELECTRIC

657-53-204

On Guard! Every Minute!

PROTECT YOUR MOTOR-DRIVEN PERMISSIBLE EQUIPMENT AGAINST ELECTRICAL BREAKDOWN BY INSTALLING O-B TYPE BDG GAS-PROOF MOTOR STARTERS



Explosion Tested by U. S. Bureau of Mines

The explosion tested starter that:

Uses Compensated Counter EMF Timing to insure smooth starting regardless of load.

Restarts automatically following power interruptions.

Provides adjustable thermal overload and adequate short circuit protection.

Offers a Built-In reversing switch where required.

May be equipped for remote control or float switch operation or both.

Is housed with a welded steel, gas-tight case.

Can be furnished for all motors 5 to 25 H. P., 250 or 500 Volts, D. C.

2708M

Write for

DESCRIPTIVE LITERATURE

Mining
CONGRESS JOURNAL

Published for the Entire Mining Industry by The American Mining Congress

JULIAN W. FEISS, Editor

Volume 32 AUGUST, 1946 Number 8

MINING AND THE COLLEGE GRADUATE

FORTY years ago the profession of mining attracted the most energetic and venturesome blood of our country. Mining was definitely a "glamour" industry, and Richard Harding Davis pictured the American mining engineer as a dynamic individual of spotless sartorial splendor who maintained production south of the border with his six-shooter and a Stetson hat. Although this characterization was exaggerated, we do know that some of our mining schools, prior to 1910, were successful in attracting men of amazingly brilliant and enterprising calibre who later in their careers established the unsurpassed reputation of the American mining man on six continents.

Recently a professor from a western mining school stated that he was greatly disturbed by the evident decline in the calibre of men attending his classes; that in his opinion the present student lacked enthusiastic initiative and very few possessed the ability and leadership so characteristic of our mining men in the past.

Is this opinion true? We do know that the professor is supported by certain others teaching in our mining schools and that at times similar judgment has been expressed by mining executives who have had reasons to criticize recent mining school graduates. The problem of securing energetic young technical men for coal mines, as well as for metal and non-metallic mining operations, has become acute. Despite this gloomy picture, we would point out that from this same generation of young men came those who stormed the beaches of Europe, those who rode the B-17s, and those who fought it out in the jungles and malarial islands of the Pacific.

If able young men are not attracted to mining today—is the fault entirely theirs? Either the industry has been presented to them in a poor light or else these youngsters feel that there is no future for them in mining.

Since the basic strength of a nation rests in large measure in the virility and enterprise of its young men, if mining is not attracting the cream of the crop the time has come to ask why.

The days of our pioneer youth are over; mining has come of age. Like other industries, mining will have to go out and rustle to secure those best suited to its future needs. It will not do to pass the buck to the mining schools as their function is essentially that of processing the material destined for mining enterprise. Merely donating money to these colleges, much though they may need it, will not check a trend away from mining, and a more dynamic policy will be required if the best of our youth are to look towards a future in our industry.

As most of us know, mining is more than a profession—it is a way of life. There is no royal road to success; the work is not easy and long experience is required. Still, much can be done to make the industry more attractive financially to young men of ambition. Pay in many large companies has not kept pace with equivalent salaries in other industries. Decent homes must be provided to satisfy reasonable living standards for growing families. Finally, the mining school graduate should have assurance of something better than an indefinite apprenticeship attending a conveyor or an ore chute. The winning of minerals from the ground—the production of new wealth—has a basic appeal to young men of imagination and ability; but unless steps are taken to make mining a more desirable calling from the standpoint of their material welfare, other fields will attract those who are needed to furnish the enterprise and leadership for our future minerals industry.

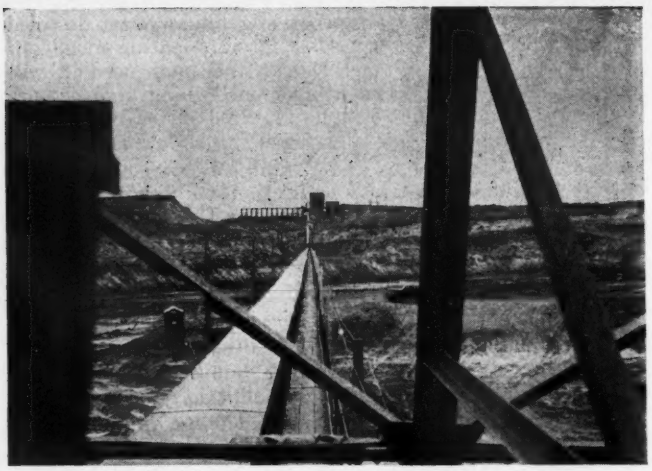
NOW THE REAL PROBLEM

WITH the President's signature on July 23, the Stockpiling Act became law. This Act, when adequate appropriations for stockpile purchases are made, will enable the building of a much-needed reserve of strategic and critical materials for the national defense. Unfortunately the task of determining future wartime requirements is far from easy. Although the problem is essentially a military one, the uncertainty should be appreciated by the minerals industry.

The first question that arises is, what metals and minerals will be required and what will be the rate of their consumption? Secondly, if we are faced with the terrible eventuality of another war, how long will it last?

Considering the rapid obsolescence of modern arms in the face of research in ordnance, and the constant development of new weapons, the answer to the first question will require exceptional insight on the part of planners assigned to this task. We are probably safe in assuming that the basic ferrous and non-ferrous metals would again be required in extremely large quantities whatever the developments in the technique of warfare may be. However, nobody can predict requirements of some of the rarer metals, such as tantalum, thorium and uranium. Prior to World War II some of these were of only minor or academic interest, but they became of vital strategic importance under the impact of accelerated wartime research.

Nazi Germany did an excellent job of stockpiling, and metal scarcities did not contribute materially to Germany's defeat. Consequently we do know that such a program can be carried out. As to the final question, involving the length of a possible next war, the answer is readily obtained by profound concentration on a 10-inch diameter, highly polished crystal ball.

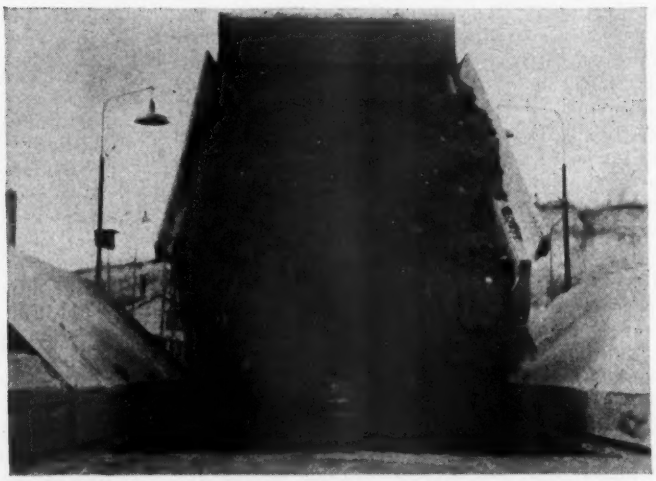


This 1730-ft. conveyor lifts ore 190 feet from pit to concentrator

By A. J. WISELEY
Minneapolis, Minn.

Making Low Grade Iron Ore Pay

Efficient Methods of Mining, Concentration, and Maintenance are Responsible for the Continued Success at Butler Brothers



Euclid 15-ton truck dumps its load of crude material into the screening plant.

DURING four war years from the beginning of 1942 until the end of 1945, Butler Brothers of St. Paul, largest independent producers of iron ore on the largest iron range in the world, shipped 13,708,896 tons of ore from 10 open-pit properties on Minnesota's Mesabi range and from two underground properties on the Cuyuna. During these years, more than 15 shovels ranging in size up to five yards loaded more than 50 15- and 20-ton trucks with 32,032,829 tons of crude material to maintain an average of about 20,000 tons of concentrated ore shipped every 24 hours.

Three elements contribute to the success of this prominent ore-producing firm: Their method of mining; their method of concentrating low-grade ores, and their program of preventive maintenance designed to keep all units working.

Butler Brothers first appeared on the Minnesota Iron Range in 1902 with a few contracts for stripping. For the next 11 years, the firm stripped and mined on contract for other concerns and then, in 1913, a handful of leases were acquired from the Great Northern Iron Ore Properties. From that year, through 33 ensuing years, Butler Brothers have enjoyed steady growth. From a meager and unnoticed beginning, the firm has become the largest independent producer of ore in the state.

The Heavy Media Process was Applied Successfully

Always progressive, the firm led the first movement to modernize methods of open-pit iron ore mining. It was among the first producers of ore to install classifiers, to perfect jigging processes, and to develop an ore separation process. In 1939 and 1940, Butler Brothers developed a differential density method of concentrating iron ore, using ferro-silicon as a media. This method has made possible quantity treatment of low-grade ore and tailings finer than any ever before treated by the sink-float method. In concentrating low-grade ores with ferro-silicon as the media, specific gravity may be increased up to 3.3 as heavy as water and still retain reasonable viscosities. Using other minerals as media—lead, for example—specific gravity may be increased up to 3.5 or 3.6. Butler Brothers use ferro-silicon because it is harder than quartz, does not break down, and can be reclaimed magnetically.

Since 1939 when the firm started experimenting with heavy media sep-

aration, four separation plants have been erected on their Minnesota Iron Range properties. Two of these are now in operation, both in open-pit properties at Cooley.

One heavy media separation plant is operating at the Harrison plant at Cooley. Here minus 5½-in. ore from the mines is conveyed to a 1⅝-in. square opening Robins-Byrex screen. Oversize is crushed in a 4-ft. Symons cone, joining the undersize on a 6 x 16-ft. Gyrex equipped with 3/16-in. cloth. Oversize is washed on a 5 x 16-ft. Robins Eliptex screen and fed directly into a 7-ft. 6-in. maximum diameter closed top heavy-media cone. Minus 3/16-in. ore and washing screen undersize is sent to the fine ore treatment plant. The capacity of this heavy-media separation plant is 180 tons per hour when treating crude ore.

The Harrison plant is treating ore finer than any ever before treated by the sink-float method. Low-grade ore and tailings from minus 3.8-in. to plus 48 mesh in size are being handled.

The second heavy-media separation plant in operation on Butler's Minnesota ore properties is located at the Patrick mine, also near Cooley. Both plants have a capacity of 320 tons per hour of cone feed.

Shovels and Conveyors Characterize Butler Operations

Butler Brothers' method of handling ore is simple and effective. Thirteen shovels ranging from 1 to 5 yards in capacity are the prime loaders. The firm is now awaiting delivery of five additional shovels larger than anything on hand; one 10-yard shovel and one 25-yard Bucyrus-Erie. The latter will be the biggest loader on the Range and equalled in size by only one other shovel in the United States.

The big shovels load to equally large trucks which constitute the hauling units. Fifteen-ton trucks are giving way to larger units. In 1942, Butler Brothers were operating 62 15-ton Euclid rear dump trucks. During the 1946 production season, the firm is using 18 Euclid 20-ton rear dump trucks and 26 of the original 15-ton trucks. The trucks carry the ore to the screening, following which it is belted to the concentrating plants.

At the Kevin open-pit mine near Cooley is the longest continuous conveyor on the Range—3,530 ft. long. This includes 1,800 ft. of horizontal conveyor and 1,730 ft. of conveyor with a lift of 190 ft. Belt is 30-in., endless vulcanized rubber, longitudinally fortified with cord. At the Kevin pit, by using the high-strength fortified vulcanized rubber belting, it has been possible to consolidate five separate conveyor systems into two systems. The 3,530 ft. of conveyor at this pit runs from an 800 ton-per-hour screening plant to an equal capacity concentrating plant located at the edge of the open pit.

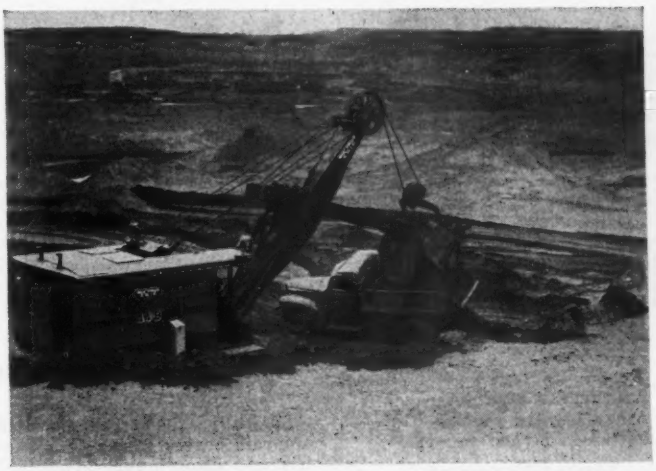
From the concentrating plants, ore is loaded directly to ore cars on spur lines which take the gravity run down to the docks at Duluth.

The Kevin mine at Cooley has been the firm's most productive mine during the last three years, producing almost 20 per cent of the total ore shipped. In 1945, 553,339 tons of ore were shipped from this mine.

An interesting sidelight on Butler methods of handling iron ore is to be found at the Patrick Annex mine, also at Cooley. Here a surge pile of overage is being built up, providing a reserve which can be drawn upon when operations are halted in the pit. When the plant is shut down or when pit production is greater than plant capacity, ore runs off the belt into the surge pile.

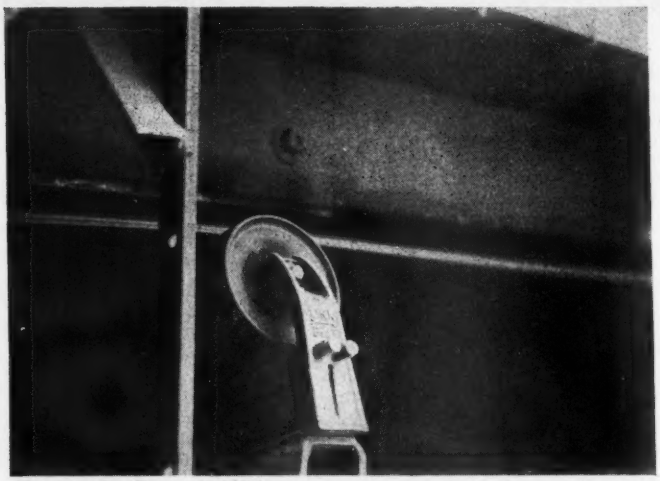
Maintenance an Important Feature of Mining Program

The third feature of Butler Brothers' methods of profitably handling low-grade ore is their program of repair and preventive maintenance. Although their original repair shop located at Cooley was one of the most modern and best equipped shops of its type in the Northwest, Butler Brothers this year have almost doubled its capacity. The original structure, a glazed tile building, is 224 ft. long by 100 ft. wide with a clearance of 18 ft. to the crane rails. To this has been added additional shop space 243 feet long by 42 feet wide. In this building, more than 200 men work 24 hours a day. Here almost every conceivable type of work is done from the manufacture of chain links and stackers 100 feet long to rebuilding and hard-surfacing dipper teeth or



Loading crude material to truck with a Bucyrus-Erie 44B shovel. This operation is in an old sludge basin. Reworking of this site is profitable as a result of the development of heavy media separation.

The large repair shop at Cooley.



Close-up of pulley on Link Belt conveyor system in the Kevin pit. Note belt covering.

completely overhauling large shovels.

The Butler program to keep the equipment in productive operation does not, however, start in the repair shop after a breakdown. Butlers' methods begin right out in the pit where a comprehensive program of preventive maintenance has been worked out for each type of equipment. Some idea of the size of their maintenance program may be obtained by considering the many and varied units of equipment in use. Included are:

Hauling and Maintenance Equipment

18 Euclid 20-ton rear dump trucks
26 Euclid 15-ton rear dump trucks
9 Caterpillar D8 tractors
10 LaPlante Choate bulldozers
5 Caterpillar No. 12 motor patrols
1 LeTourneau 8-yard scraper
2 Athey 15-yard wagons
1 Patterson 8-yard wagon

Loading Equipment

6 Bucyrus-Erie 120B 4-yard and 4½-yard electric shovels
3 Northwest 2-yard shovels
1 Marion 1-yard gas-electric shovel
1 Marion 5-yard electric shovel
1 Bucyrus-Erie 44B 2-yard shovel
1 Bucyrus-Erie 54B 2½-yard shovel

Movable Hoisting Equipment

1 Ohio 20-ton steam crane
1 Brown 15-ton steam crane
1 Lima 12-ton gas crane on crawlers
1 Bay City 20-ton automotive crane on six wheels

Drilling Equipment

4 Bucyrus 27T gas drills for 6-in. holes
1 Bucyrus-Armstrong 29 electric drill for 6-in. holes
2 Bucyrus 29T electric drills for 9-in. holes
1 Barmengo horizontal gas drill for 3-in. holes
1 Hardscog horizontal gas drill for 6-in. holes

In addition to these units of equipment, there is a total of more than two miles of Link-Belt conveyor system ranging in size from 24 in. to 36 in. in the open-pit mines.

Perhaps the most inclusive maintenance program was developed for the trucks. The Euclids, both 15- and 20-ton, are equipped with air brakes, hydraulic hoists, and in some instances, air booster steering, for it is not exactly like wheeling a Buick along concrete highways when a driver starts out for a screening plant with a full load!

Trucks are Under Continuous Servicing

Logically, the truck maintenance program begins with selection of the drivers. About a nucleus of 15 skilled and especially trained drivers, Butler Brothers have set up their own course of instruction. Student drivers are under the surveillance of the instructors until they demonstrate complete capability.

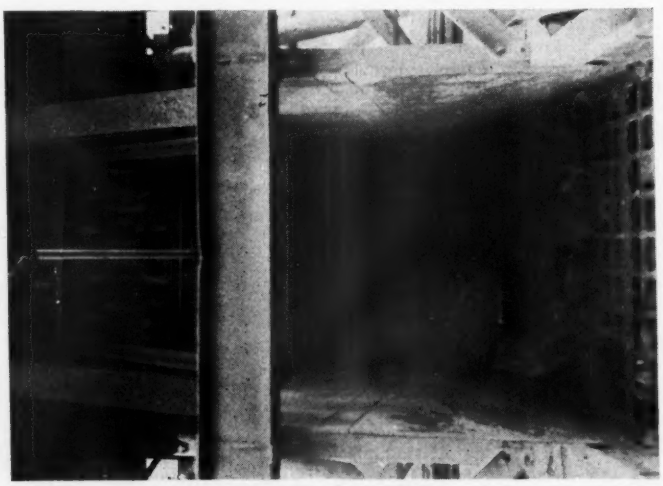
Each truck is completely serviced, checked and lubricated every 24 hours. This schedule is maintained regardless of the number of hours during the period the truck has actually been in operation. A typical shift might find eight trucks assigned to a four-yard shovel, but only seven trucks working at one time, with the eighth in for service. Here field service garages are at each mine, equipped with complete facilities, for checking and servicing the trucks right down to a frame and body job.

Routine maintenance of the trucks includes not only lubrication, fueling and checking oil, but checking tire pressure, water, inspecting the motor, gear housing, transmission, frame and brakes. After an average operation of 5,000 hours, the diesel motors are taken into the repair shop for a complete overhaul.

Another example of the maintenance program that reaches from the shop out into the field is the care and servicing of the conveyor systems. Since rain and moisture sometimes dry out pulley bearings which result in slippage, the conveyors at Butler properties are enclosed. Lighted walkways flank the conveyors for convenience in checking. Rollers are inspected regularly and greased every week. The upkeep on the conveyors is nominal.

Regular inspections for worn parts or impending breakdowns are made of other units of equipment in the field. The ore shovels are lubricated on the job twice during each shift. Units such as tractors and motor patrols, used mostly for maintenance of the lengthy system of haul roads, are greased every 24 hours and checked regularly for needed repairs. A schedule of overhauls has been set

(*Continued on page* 65)



Looking into the jaws of the screener.

Cripple Creek Increases Production

The Cresson is one of Cripple Creek's most productive mines.

This famous Colorado Gold District may be on the threshold of new developments now that the Carlton Tunnel has drained untouched blocks of ground

★

By

MARGARET GEDDES

and

KENNETH GEDDES

Cripple Creek, Colo.

★

DURING the months since V-J Day the Cripple Creek gold mining district has slowly but surely emerged from the state of hibernation into which it was forced by the edict of the War Production Board and war conditions generally.

Throughout the war years several of the larger mines had been able to operate on a very limited scale, in spite of Order L-208, which closed the gold mines of the country, because a moderate production from these properties was necessary in order to keep the Golden Cycle mill at Colorado Springs operating. This custom mill converted the main part of its plant for the treatment of zinc-lead ores vital in the manufacture of war materials.

The Ajax mine of the Golden Cycle Corporation, the Portland and Vindicator, of the United Gold Mines Company, and several others were thus enabled to keep working in a small way, but the others were closed down.

High wages at the war industrial plants lured many of the miners away —although very few went into the copper mines, which was the declared purpose of the gold mine closing order—and Cripple Creek, Victor, and the smaller settlements of the mining district made fair to join the ranks of the ghost towns of the West. The low point in the production of the camp came in 1945.

With the end of hostilities, however, a "back-to-the-mines" movement began to be felt, and gradually one property after another has reopened, as the return of the miners made it possible. A number of new companies have transferred their interests from other activities and have invested in Cripple Creek properties with the result that the camp now appears to be definitely on the upswing once more.

Over Twenty-five Mines Now Operating

The summer of 1946 finds at least 25 gold mines at work which were not operating three years ago, among them the Commonwealth, Jo Dandy, Wild Horse, Jerry Johnson, Pinto,

Proper, Shurtloff, Flying Cloud, Last Chance, Orpha May, Glorietta, Anaconda tunnel, Anaconda winze, Wedge, Moffat tunnel, Smith-Moffat, Saunders, South Burns, Trail tunnel, the Cresson, the Strong mine, and the El Paso.

Business in Cripple Creek and Victor has accordingly experienced a pick-up of late, boards have been removed from the windows of the many houses which have been closed up and desolate since 1942, and there is every indication that the West's greatest gold camp will again take its place among the important mining centers of the country.

The Cripple Creek district is the newest of the great gold discoveries of the United States. When the precious metal was first found in 1891 on the banks of the creek which gave the camp its name, by Bob Womack, a cowboy who had ridden the range in the vicinity for a number of years, Central City, Leadville, the San Juan district had passed their heyday, and the rush began to the Pike's Peak region. Buildings rose over night and Cripple Creek, Victor, and the surrounding towns boomed. They survived several devastating fires, and still they grew and the hills about the camp were crowned with more and more mine shafts.

Production reached its peak in 1903, although since that time it has been large and steady except for the period of the past four years when the industry was crippled.

District in Shadow of Pike's Peak

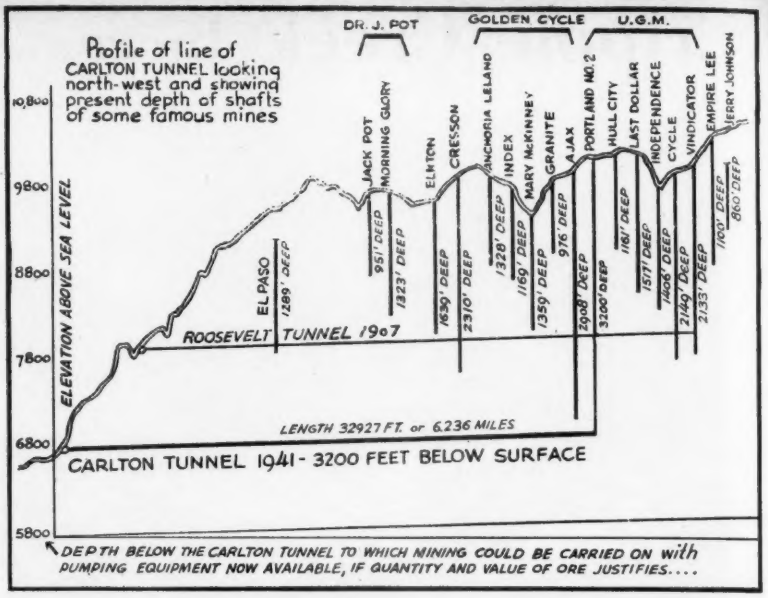
The area which has produced such an enormous share of the world's wealth is located 20 miles south of Pike's Peak, on a plateau of pre-Cambrian granite, gneiss and schist, about 10,000 feet above sea-level. The gold ore is deposited in veins in a plug, about three miles in diameter, which was formed in the walls of the crater of an old volcano. This plug, and the surrounding walls of granite, are cut by dykes of phonolite, cyanide and by basic dykes. The ore deposits are found in veins, irregular bodies and collapsed breccia deposits.

Many of the veins follow the dykes. The lodes are chiefly found as filling deposits, although in places they replace the country rock.

Gold tellurides are the principal mineral, and there is little native gold except in the oxidized zone.

No other minerals are found in any appreciable quantity in the area.

Most of the ore in the Cripple Creek district is mined by shrinkage fill stoping. Because of the hard rock structure, about the only timber used is for constructing chutes and manways. Immense stopes have been mined out of many properties and left entirely open. For instance, the great vug in the Cresson mine, from which a million dollars' worth of ore was taken, now remains as a vast open cave, 200 ft. across, and 400 ft. long, on the twelfth level.



Carlton Tunnel Driven to Drain District

The gold deposits in the Cripple Creek district have been worked to a depth of 3,100 ft. below the surface of the ground. This has been made possible through the drainage of the area by the new Carlton tunnel, which has already proved itself the vital factor in the prolongation of the life and the production of the district.

The tunnel, begun in 1939 and completed in two years, was driven by the Golden Cycle Corporation, with A. H. Bebee, vice president, in charge. It is six miles long, and connects with the Portland shaft at a depth of 3,250 ft. below the surface. When tunnel engineers "holed through" the granite-breccia contact, or wall of the crater, and up into the Portland winze level, 3,100 ft. below the surface, a flood of water poured from the mine and out the tunnel at the rate of 100,000 gallons per minute. Water runs from the portal of the tunnel now at the rate of 4,000 gallons per minute.

The Carlton tunnel provides 1,100 ft. more drainage than the district mines had prior to its construction, and in the five years since its completion the drainage tunnel has more than paid for itself in new ore bodies

New sampling operations are under way at Gold Hill.

opened up and made available for mining.

The property which has probably profited most by the unwatering of its lower levels and additional territory is the Ajax. This mine lies in the granite a short distance from the granite-breccia contact, and all the ore mined on it comes from veins in the granite. Since the tunnel's completion development work on the Ajax has discovered unusually good ore shoots on the Bobtail and Newmarket vein systems. The Ajax has been totally drained to the Carlton tunnel level, and has been developed to a depth of 2,700 ft. This property was the mainstay of the district throughout the war years and shows every prospect of continuing its great record.

The lower levels of the Portland mine, where for many years pumping was necessary in order to carry on work, are now dry and considerable development work has been carried on there. The shaft of this mine was sunk to the tunnel level in 1942 and a large station constructed on this 3,250-ft. level.

The Cresson mine, for many years the biggest single producer of the Cripple Creek district, reopened in April, 1946, after a shutdown of three years. The activity of this mine is often considered a barometer of conditions in the gold camp, and its reopening was looked on as the turning of the tide toward better days by many of the mining world. The ore bodies in the Cresson occur in and around a pipe about 500 ft. in diameter. The rock in this pipe is a dark, altered, fractured basaltic breccia, with large masses of intrusive basalt.

Drainage Laterals Projected

This property has been drained by the tunnel to a depth of 375 ft. below the old water level, and it will probably be necessary, A. H. Bebee, general manager states, to drive a lateral from the Portland to the Cresson on the Carlton tunnel level to drain the property entirely.

It is also planned to drive a lateral from the Portland to the Vindicator and Golden Cycle mines at the tunnel level, to afford drainage to them, and this will probably be carried out as soon as the necessary labor is available.

The El Paso mine, recently purchased and reopened by El Paso Mines, Inc., with Harvey Tedrow, president of the Colorado Mining Association as general manager, is unique in that it lies on a phonolite plug, outside the main crater where the mines are located. The company is carrying on an extensive development program on this property. The El Paso has also profited by the drainage of the Carlton tunnel and all levels are dry.

All ore from the Cripple Creek district is being shipped to the Golden Cycle custom mill at Colorado Springs at the present time, a distance of 45 miles, over the Midland Terminal Railroad. The treatment rates at this mill are among the lowest in the world, one of the factors that has kept the Cripple Creek district alive for so many years. The small operator or leaser is able to dispose of his ore at a very low freight and treatment rate, and thus is able to work a property on a small margin.

Ninety-eight per cent of the gold ore treated at the Golden Cycle mill comes from the Cripple Creek district. It is treated by the cyanide flotation process.

One of the measures taken to keep up sufficient tonnage for the mill and the Midland Terminal Railroad, which is the only railroad serving the district, during the war shutdown, was the shipping of large quantities of low-grade dump rock. This rock was dumped in the days of a lower price on gold, and is now worth shipping in large quantities at times when the freight trains and the mill are not overloaded.

In normal times, about 50 per cent of the ore received at the Golden Cycle mill is shipped from the various leases throughout the Cripple Creek district.

Leasing System Most Successful

The district has often been called the "leasers' paradise," for the leasing system has been worked out and carried farther here than in any other camp in the world, in all probability, and it accounts for 50 per cent of the mining activity of the area.

Two forms of leases are in general use. On the larger properties the "split check" system is used. In this system, the company grants a block of ground, generally 200 or 300 ft. square, running from one level to another, to a group of men. The lessee furnishes the labor, also drills, hose and small tools, while the company furnishes all supplies such as powder, steel, air, and timber, and does the hoisting. The ore is shipped in the lessee's name and he is paid direct by

Where mining started. The headframe of Stratton's Independence.

Ajax ore comes from veins in granite.

the mill. The lessee receives 50 per cent of the net returns and the company the other 50 per cent. On mines such as the Portland, Vindicator, Cresson, and Ajax, as high as 30 sets of lessees are working, usually on the upper levels, while the company work is carried on at deeper horizons.

On the outside properties, away from the larger mines, ground is usually leased on a royalty basis, running from 5 to 30 per cent of the net mill returns. When the royalty system is employed, the lessee furnishes everything.

The leasing system has worked out most satisfactorily in Cripple Creek and no doubt has contributed toward keeping the district alive during the trying times of the past years. Gold miners are an independent group, and many will lease who will not work for wages.

Leasing as it is done in this district, has been called the only form of free private enterprise now open to a man with little capital, and many a lessee has put in no more than his labor and mining ability, with little or no cash, and has realized a substantial living or even a small fortune.

A Dramatic Strike

An ex-GI, who has developed and worked a lease on the Portland mine, for instance, found himself nationally famous overnight, after newspaper photographers and magazines discovered that he had realized about $25,000 from his lease in the six months after he returned from service in the Army. Such cases as this are of course rare, but the fact remains there is still more than a fighting chance for the man who has some knowledge of mining and who prefers to work for himself rather than to be regimented.

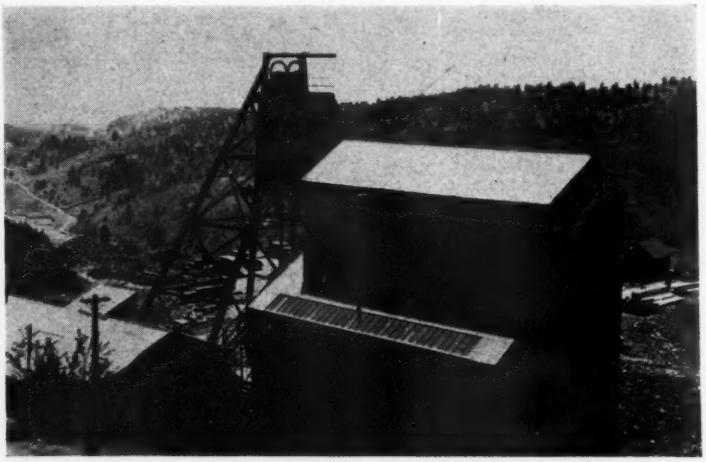
Considerable interest is being shown in the long-range sampling and exploration program begun this year and carried on by Mines, Inc., on the Globe Hill properties of the Cripple Creek-Stratton Mining and Development Company and the Ironclad Hill properties of Thomas Kavanaugh. Mines, Inc., has built a sampling plant through which 180 to 200 tons a day pass.

Samples are being taken by a power shovel and by hand from existing road and railroad banks where the exposure is over 5 ft.; from large and small dumps, prospect holes and mines, many of which represent every type of rock which has been taken out; and from trenches 6 to 9 ft. deep over the surface of the hill. Underground sampling is also being done.

At the plant more than 100 samples are being reduced to pulp and filed every day, for future study and classification.

Mines, Inc., plans to carry on large-scale mining and milling operations in the Cripple Creek district if it is determined to be worthwhile from the findings of the sampling program.

The all-time production of the Cripple Creek district is over $400,000,000 worth of gold, in its slightly more than 50 years' history. Whether the next 50 years will double the amount depends on a number of factors. A raise in the price of the district's only commodity would, of course, be a tremendous help and would make it possible to operate many properties where the margin of profit is too narrow at present.



The El Paso is carrying out an extensive development program

Pike's Pike overlooks Cripple Creek operations

Labor Still Critical

The greatest handicap which operators are having to combat today is the labor shortage, which is still critical. Wages have been raised in an effort to compete with the inflated pay at industrial plants, and with the reconversion and curtailing of operations in many other places, together with the cutting down of working hours, this has attracted a number of men who, foreseeing harder times elsewhere, are returning to their former homes.

Houses are still plentiful in Cripple Creek and Victor and rents are much lower than in other localities.

One of the advantages of the Cripple Creek district is its easy accessibility to Denver, Colorado Springs, and other cities at a lower altitude. Snowfall is not heavy as it is on the western slope, and the roads are rarely closed, even for a day.

Shipments from this camp have increased slowly but steadily since the summer of 1945, when the low point in production was reached; most of the mines have good ore in sight or blocked out; the price of Cripple Creek stocks has gone up and held high even through the worst times in its history; and even the most hardened pessimists believe that Cripple Creek, instead of being a war casualty, is again on its way to becoming one of the world's greatest producers of the world's most prized and coveted commodity—gold.

Miners Haven

THAT'S DENVER'S HISTORY

THE year was 1870—General Grant was serving his first term as President—37 States made up the Union—Colorado was still six years from Statehood—mine rushes were filling the mountains with miners and prospectors—4759 people living in Denver—practically all engaged in mining or supplying miners with tools, food and pack-animals.

From this small beginning as a mining center, in a short span of years, Denver developed into the largest city between Kansas City and the Pacific Coast—becoming an important center of mining machinery manufacture, as well as a focal point for outstanding distributors of mining equipment.

Today, as in the past, Denver is recognized as "headquarters" for the mining industry of the West—serving and reaching every mining district from the Mississippi to the Pacific—with machinery, supplies, finance, transportation, engineering and metallurgy. Denver-made mining machinery is also known throughout the world.

When in need of equipment for mining, milling or smelting operations — Contact Denver "The Source That Never Fails."

WELCOMING YOU TO COLORADO, REPRESENTATIVE DENVER MANUFACTURERS PRESENT HEREWITH A MESSAGE OF REAL INTEREST TO MINING MEN

IMPROVED EQUIPMENT
FOR LOWERING MILL COSTS

Marcy Open-End Mills
Massco-Fahrenwald Flotation

Above: The Massco-Fahrenwald Flotation Machine, designed by Dr. A. W. Fahrenwald, world-famous authority on flotation.

Left: 27 10' x 10' Marcy Open-End Ball Mills in one of the world's largest single unit concentrators.

MINING and milling costs must come down—and will. This will be accomplished largely thru improvement in equipment toward more efficient use of present day processes.

Since 1914 the development of Marcy Mills has been an unending exploration for improvement. This same patient inquiry, experiment and observation has gone into the development of Dr. Fahrenwald's new improved flotation machine.

Our years of metallurgical experience are available to you whenever you say the word.

Main Office: Denver, Colorado, U. S. A.
El Paso, Salt Lake City
1775 Broadway, New York
Canadian Vickers, Ltd., Montreal
W. R. Judson, Santiago and Lima

Genuine Wilfley Tables; Massco-McCarthy Hot Millers; Rock Bit Grinders; Density Controllers; Belt Feeders; Pinch Valves; ASSAY AND LABORATORY SUPPLIES AND EQUIPMENT; COMPLETE MILLING PLANTS.

The Mine & Smelter Supply Co.

From long experience and painstaking study of actual operating conditions, CF&I PRODUCTS for the MINING INDUSTRY have been developed to give outstanding performance.

Wissco Perforated Metals
Wissco Industrial Screens
Calwico Industrial Screens
Wickwire Spencer Wire Rope
CF&I Forged Steel Grinding Balls
CF&I Grinding Rods
CF&I Mine Rails and Fastenings
CF&I Tunnel Supports

WICKWIRE SPENCER STEEL DIVISION
The Colorado Fuel and Iron Corporation
THE CALIFORNIA WIRE CLOTH CORPORATION

EASTERN SALES OFFICES	EXECUTIVE OFFICES	WEST COAST OFFICES	KEY CITY OFFICES
500 Fifth Ave., N.Y. 18, N.Y.	DENVER, COLORADO	OAKLAND, CALIFORNIA	SEE PHONE BOOK

ONLY GARDNER-DENVER Gives You These SPECIAL FEATURES

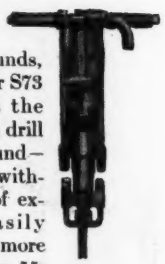
Completely Automatic!

Mine operators call the Gardner-Denver CF89H Automatic Feed Drifter the *only* completely automatic drifter on the market. It requires no adjustment while drilling—feeds itself in accordance with the character of the ground. The drill does the work—not the operator!

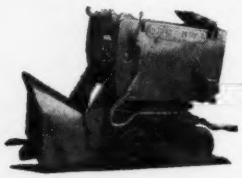
Two-way Balance!

In the Gardner-Denver R104 Stoper, the stinger never feels light—the nose always stays up. This better physical balance means easier handling. In the R104, too, the feed pressure is balanced with the power of the drill itself. No pull on the holding handle. Fully automatic air cleaning system keeps out water and sludge from the drill.

Drill Deeper Holes — With Less Weight!

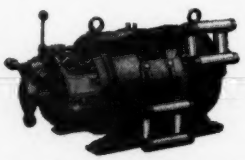


Weighing only 67 pounds, the Gardner-Denver S73 Sinking Drill has the speed and power to drill faster in harder ground—to drill deeper holes without the handicap of excess weight. Easily handled, it uses no more air than the average 55-pound drill. The Gardner-Denver Sinking Drill line is complete—offers a weight for every need.



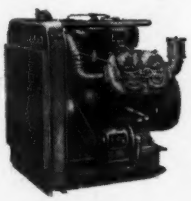
Greater Power— Faster Loading!

With *two* air motors, the GD14 Mine Car Loader has greater power for large capacity and faster loading. Designed with an extremely low center of gravity, it is *safe*. Design is cleaner—no outside piping or "gadgets." Adjustable swing stops allow more digging positions on either or both sides. Rounded rear shield permits close couplings of mine cars.



Single Lever Control!

There's only *one* control lever on the Gardner-Denver Airslusher—and it operates at a touch. Compared with other slushers, the Gardner-Denver Airslusher has one-third the number of gears—one-third the number of bearings—one-third the number of lubrication points. Powered with a five-cylinder, high torque radial air motor, it has more load lugging ability for bigger loads—a faster return of the empty scraper.



Horsepower Saver!

The unique design of Gardner-Denver WB Vertical Water-Cooled Compressors permits lower air temperatures—with corresponding saving in horsepower. WB Compressors are remarkably compact—yet have efficiencies comparable to those of large horizontal compressors. Capacities 142 to 445 cubic feet displacement per minute.

SPECIAL INVITATION

All delegates to the Metal Mining Convention and Exposition at Denver, Colorado (Sept. 9 to 12, 1946) are cordially invited to visit the Gardner-Denver Plant in Denver. See for yourself the skill and care which go into Gardner-Denver Rock Drills and mining equipment.

***For complete information, write* Gardner-Denver Company, Quincy, Illinois**

GARDNER-DENVER

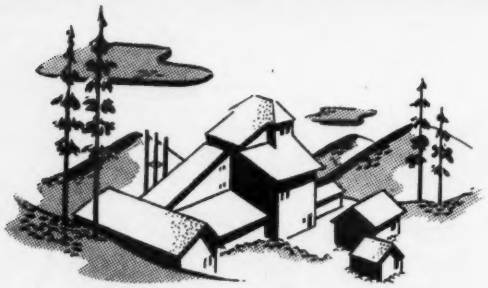
Since 1859

For your Construction Program

• Engineers • Manufacturers
• Constructors

Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO



DENVER "SUB-A"
STANDARD THE WORLD OVER

ORE TESTING... *for the processing, beneficiation, and concentration of any material mined from the earth.*

EQUIPMENT... *complete plant equipment for processes requiring flotation, gravity concentration, counter-current decantation, leaching and amalgamation.*

DECO TREFOIL... *contains current metallurgical data from successful operating plants. Write for your copy.*

STANDARD RELIABLE 24 HOUR SERVICE EFFICIENT

"The firm that makes its friends happier, healthier, and wealthier"

DENVER EQUIPMENT COMPANY
P.O. BOX 5268 • DENVER 17, COLORADO

DENVER 17, COLORADO: P. O. Box 5268
NEW YORK CITY 1, N. Y.: 4114 Empire State Bldg.
CHICAGO 1: 1123 Bell Bldg., 307 N. Michigan
TORONTO, ONTARIO: 45 Richmond Street W.
VANCOUVER, B. C.: 305 Credit Foncier Bldg.
MEXICO, D. F.: Edificio Pedro de Gante, Gante 7
LONDON, EC2, ENGLAND: Salisbury House
JOHANNESBURG, S. AFRICA: 8 Village Road
RICHMOND, AUSTRALIA: 530 Victoria Street

The Complete Report

OF THE

Metal Mining Convention and Exposition

WILL BE PUBLISHED

IN THE *October* ISSUE OF

MINING CONGRESS JOURNAL

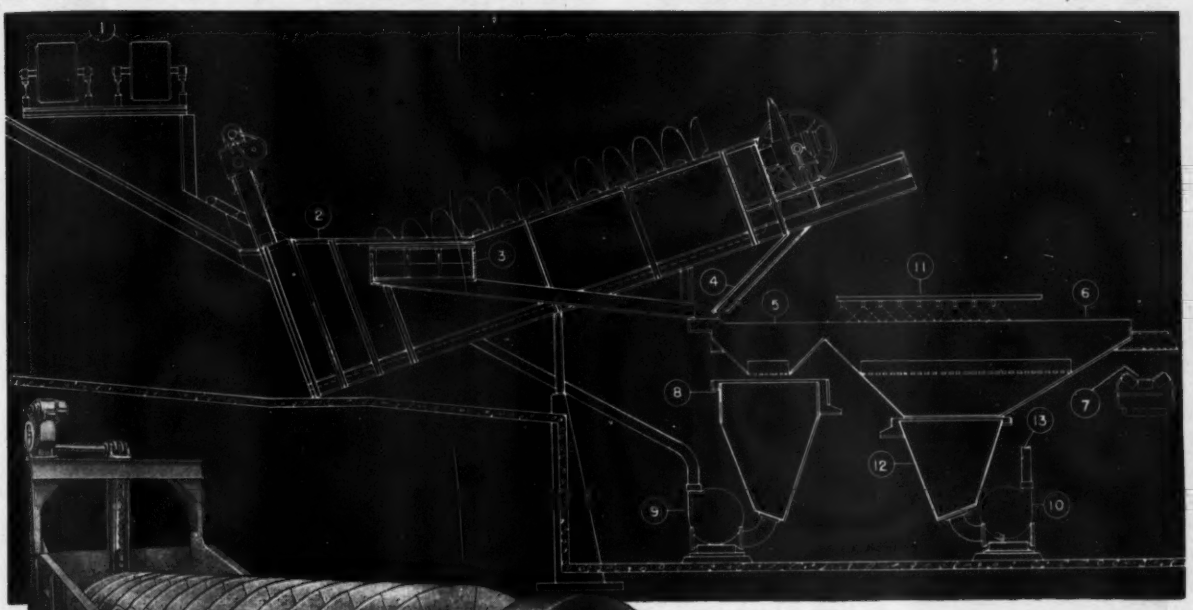
•

Planned to give the industry the fullest possible story of this meeting

•

Watch for your October Number

A SIMPLIFIED FLOWSHEET FOR HEAVY MEDIA SEPARATION



with the

AKINS *Separator*

1. Crushed, washed, screened ore
2. AKINS Separator
3. Float product overflow
4. Sink product discharge
5. Two drainage screens, for float and sink
6. Two washing screens, for float and sink
7. Two conveyors to waste and concentrate bin
8. Medium drainage hopper
9. Medium circulating pump
10. Screen washings pump
11. Washings sprays
12. Screen washings hopper
13. To medium cleaning circuit

Operating in a considerably simplified flowsheet, AKINS Separators have been used in sink-float treatment of Minnesota sub-grade hematite ores over a period of many months — in full scale operations.

It is now common knowledge in the Iron Ranges that higher grade concentrates are being consistently produced — with lower tailings than by any other equipment. No compressed air required; relatively little pumping necessary; power consumption substantially less. The Akins Separator is not stalled by surges in feed; starts without emptying tank after shutdowns.

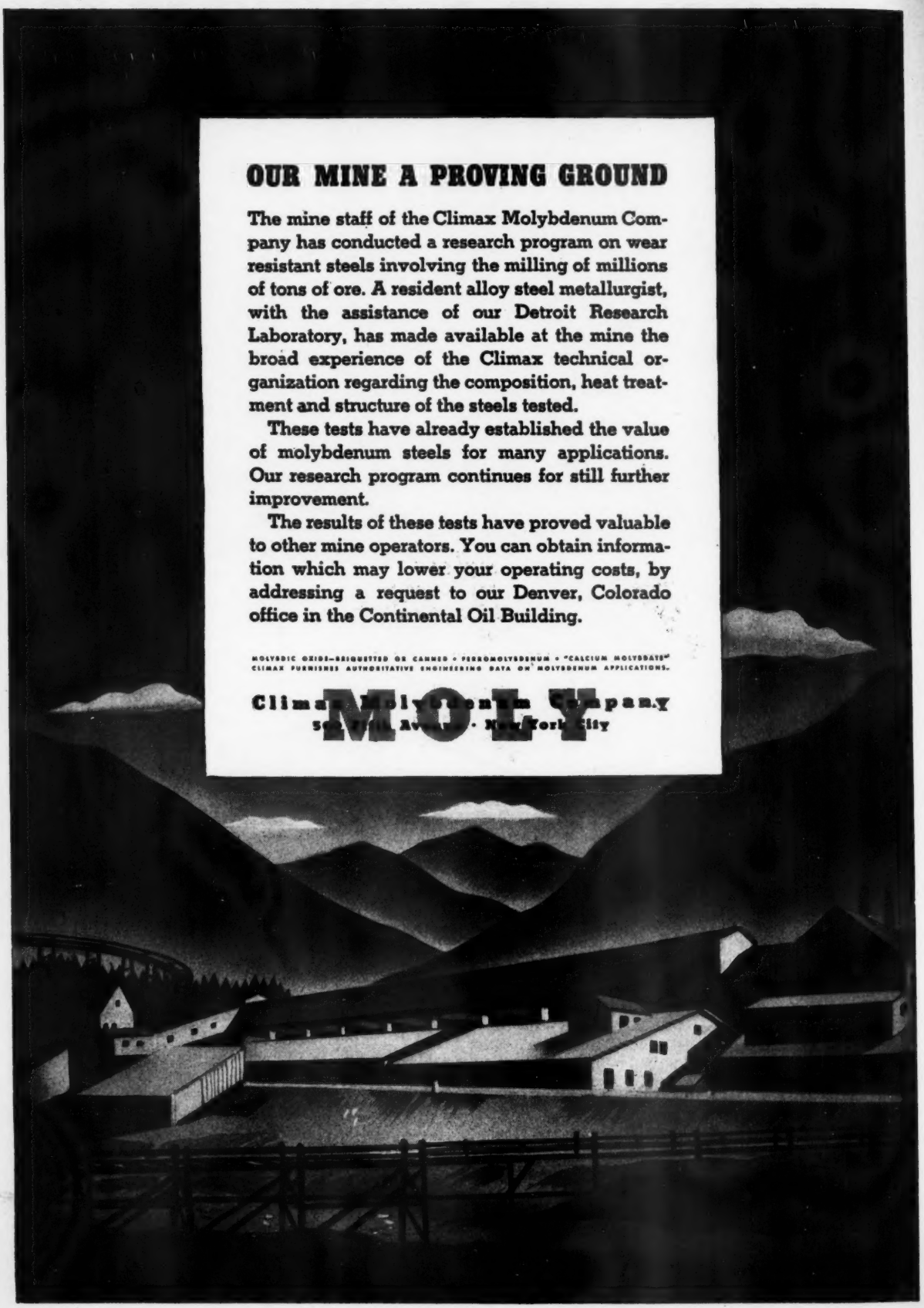
***These cost-lowering advantages are applicable to other materials which respond to heavy media separation. Permit us to submit the facts.**

We also manufacture: Akins Classifiers and Densifiers; Lowden Dryers; Skinner Multiple Hearth Roasters.

COLORADO IRON WORKS Company

Canadian Locomotive Co., Ltd., Kingston, Ont., Can.
Vancouver Iron Works, Ltd., Vancouver, B. C., Can.
Head, Wrightson & Co., Ltd., Stockton on Tees, England
Head, Wrightson & Co., (So. Africa) Ltd. Johannesburg
The Clyde Engineering Co., Ltd., Granville, N. S.W.

MAIN OFFICE & WORKS: DENVER 2, COLO., U. S. A.


OUR MINE A PROVING GROUND
The mine staff of the Climax Molybdenum Company has conducted a research program on wear resistant steels involving the milling of millions of tons of ore. A resident alloy steel metallurgist, with the assistance of our Detroit Research Laboratory, has made available at the mine the broad experience of the Climax technical organization regarding the composition, heat treatment and structure of the steels tested.
These tests have already established the value of molybdenum steels for many applications. Our research program continues for still further improvement.
The results of these tests have proved valuable to other mine operators. You can obtain information which may lower your operating costs, by addressing a request to our Denver, Colorado office in the Continental Oil Building.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLY

METAL MINING CONVENTION *and* EXPOSITION

DENVER, COLORADO

September 9-12

WESTERN DIVISION · AMERICAN MINING CONGRESS

J. B. HAFFNER
General Manager
Bunker Hill & Sullivan
Mining & Concentrating Co.
General Chairman, Program Committee

HOWARD I. YOUNG
President, American Zinc, Lead & Smelting Co.
President, American Mining Congress

MERRILL E. SHOUP
President, Golden Cycle Corp.
Chairman, Western Division

R. H. PEARSON
Vice President,
Gardner-Denver Co.
Chairman, Manufacturers Division, A.M.C.

Denver to Welcome Metal Miners

Metal Miners Throughout the United States Will Gather in Denver to Discuss Their Mining Problems and Sample the Hospitality for Which This Western City is Famous

WITHIN sight of the snowcapped Rocky Mountains, the Metal Mining Industry will hold its first post-war Convention and Exposition in the City Auditorium of Denver, September 9-12, 1946. Under the able chairmanship of J. B. Haffner the Program Committee has been busy drawing up plans for a most interesting program, which will embrace almost every phase of metal mining and its allied problems. The unusually comprehensive scope of the meeting is indicated by some of the topics to be discussed, including: manpower for the mines, industrial relations and labor legislation, future economic and market conditions, subsidies or free markets, tariff policies, stockpiling, rehabilitation of gold mining, the future of silver, ore reserves and future exploration, incentives needed for mineral development, federal taxation, public land policy, public relations, and a complete review of the latest mechanical developments in under-

ground and open pit mining, and of improvements in milling practice.

Exposition to Display Newly Developed Equipment

In addition to the meeting the City Auditorium will be the headquarters for an Exposition featuring the products and services of over 80 leading manufacturers. A complete range of mining and milling machinery will be displayed and demonstrated. Representatives of the technical staffs of these manufacturers will also be present to answer questions and aid in explanation of the exhibits. The Exposition will be open the full four days of the meeting. Not only the executives of mining companies but mine and mill superintendents, engineers, chief electricians, mechanics and other operating personnel will obtain a comprehensive picture of what is now available in the equipment line and will have an opportunity of seeing first hand the various types of machinery that have been developed during recent years.

Nationally Known Figures Will Participate

Headline speakers include the Hon. J. A. Krug, Secretary of the Interior; United States Senators Abe Murdock of Utah, Edwin C. Johnson of Colorado, Wayne Morse of Oregon, Joseph H. Ball of Minnesota, and Joseph C. O'Mahoney of Wyoming. Leaders in the mining industry and officials of Federal agencies whose activities are concerned with mining will also take an active part in the sessions.

A welcoming luncheon will feature the first day of the meeting and will be presided over by Merrill E. Shoup, Chairman, Western Division, American Mining Congress. The Honorable Ben F. Stapleton, Mayor of Denver, and the Honorable John C. Vivian, Governor of Colorado, will welcome the visitors to the Convention, while responses will be made by Howard I. Young, President of the American Mining Congress, J. B. Haffner, Chairman of the Program Committee, and R. H. Pearson, Chairman of the Manufacturers Division. Guest speaker at this luncheon will be the Honorable Edwin C. Johnson, United States Senator from Colorado.

Program of Broad Scope

The program will cover not only the overall problems of metal mining and its future but also the mechanization of mining operations to develop greater efficiency and productivity. Two afternoons will be free of meetings so as to afford full opportunity

HON. J. A. KRUG
Secretary of the Interior

for thorough study of the exhibits.

One session will be devoted to the general outlook for the metals. The world economic problems of copper, lead, zinc, gold and silver will be discussed by such authorities as James Douglas of the Phelps Dodge Corporation, Donald H. McLaughlin, president of the Homestake Mining Company and Senator Abe Murdock of Utah. Problems of Federal mine taxation will be also reviewed at this session by Henry B. Fernald, Chairman of the American Mining Congress Tax Committee.

Coupled with this session is a second on the subject of metal subsidies, tariff policies and stockpiling. Here there will be discussions of the Premium Price Plan for copper, lead and zinc; trade agreements and the "Good Neighbor" policy in relation to the import of metals, and administration of the stockpile measure, designed to assure adequate stocks of mineral raw materials for future security. The industry's viewpoint of metal subsidies, tariffs and stockpiling will be presented by speakers from the various branches of metal mining.

Manpower and Labor Relations

Giving present-day problems of labor legislation a thorough airing, United States Senators Wayne Morse of Oregon and Joseph H. Ball of Minnesota will present their viewpoints as to "What is Needed in a Sound Code of Labor Law?". This problem is occupying some of the best minds in the country today and

ARRANGEMENTS COMMITTEE

MERRILL E. SHOUP
Chairman, General Committee

O. H. JOHNSON
Chairman
Reception

MRS. A. E. CARLTON
Chairman
Ladies' Committee

MRS. R. S. PALMER
Vice Chairman
Ladies' Committee

ROBERT S. PALMER
Vice Chairman, General Committee

R. H. SUMMER
Chairman
Entertainment

E. D. DICKERMAN
Vice Chairman
Entertainment

A. ROY WICKER
Chairman
Transportation

ROY B. EARLING
U. S. Smelting Refining & Mining Co.
ALASKA

C. R. KUZELL
Phelps Dodge Corp.
ARIZONA

WORTHEN BRADLEY
Bradley Mining Co.
CALIFORNIA

WILLIAM J. COULTER
Climax Molybdenum Co.
COLORADO

PROGRAM COMMITTEE . . .

State Chairmen and Committee Members

ALASKA

AL ANDERSON
Alaska Miners Association

W. A. CASTLETON
Castleton & Bey

JAMES K. CROWDY
New York Alaska Gold Dredging Co.

H. L. FAULKNER
Faulkner & Banfield

CHARLES J. JOHNSTON
Goodnews Bay Mining Co.

ERNEST N. PATTY
Alluvial Golds

NORMAN C. STINES
Alaska Empire Gold Mining Co.

HENRY WAECHTER
Alaska Pacific Consolidated Mining Co.

J. A. WILLIAMS
Alaska Juneau Gold Mining Co.

ARIZONA

W. C. BROADGATE
Washington, D. C.

T. G. CHAPMAN
University of Arizona

J. S. COUPAL
Phoenix, Ariz.

ERNEST R. DICKIE
Bagdad Copper Corporation

C. H. DUNNING
Department of Mineral Resources

MARK GEMMILL
Mare Mining Co.

WESLEY P. GOSS
Magma Copper Co.

P. D. I. HONEYMAN
Inspiration Consolidated Copper Co.

ROBERT W. HUGHES
Miami Copper Co.

H. F. MILLS
Shattuck Denn Mining Co.

BRENT N. RICKARD
American Smelting & Refining Co.

ROBERT W. THOMAS
Kennecott Copper Corporation

CHARLES F. WILLIS
Arizona Small Mine Operators Association

CALIFORNIA

P. R. BRADLEY, JR.
Pacific Mining Co.

W. C. BROWNING
Golden Queen Mining Co.

CECIL F. BURTON
Burton Brothers, Inc.

JAMES L. BRUCE
Cyprus Mines Corp.

GORDON I. GOULD
H. W. Gould & Co.

CLAUDE G. GRIM
Pacific Coast Borax Co.

VICTOR J. HAYEK
Mining Association of the Southwest

IRA B. JORALEMON
Consulting Engineer

G. A. JOSLIN
Los Angeles Chamber of Commerce

ESTEY A. JULIAN
Goldfield Consolidated Mines Co.

ALBERT F. KNORP
California Chapter, American Mining Congress

H. S. LORD
Dragline Gold Producers of California

J. D. MACKENZIE
American Smelting & Refining Co.

J. R. C. MANN
Empire Star Mines Co., Ltd.

NEIL O'DONNELL
Idaho Maryland Mines Corp.

H. A. SAWIN
Yuba Consolidated Gold Fields

ROBERT M. SEARLS
California Chapter, American Mining Congress

COLORADO

A. H. BEBEE
Golden Cycle Corp.

J. PRICE BRISCOE
Clear Creek County Metal Mining Association

JOHN D. HAMM
John Hamm Mining & Milling Co.

J. PAUL HARRISON
American Smelting & Refining Co.

OSCAR H. JOHNSON
Idarado Mining Co.

FRANK J. MALOIT
New Jersey Zinc Co.

F. S. MCNICHOLS
Climax Molybdenum Co.

ROBERT S. PALMER
Colorado Mining Association

BEN H. PARKER
Colorado School of Mines

B. T. POXSON
Imperious Mining Co.

J. L. ROBISON
U. S. Vanadium Corp.

JOSEPH T. HALL
Callahan Zinc-Lead Co., Inc.
EASTERN

H. L. PIERCE
M. A. Hanna Co.
LAKE SUPERIOR

E. S. MCGLONE
Anaconda Copper Mining Co.
MONTANA

CASH I. COOK
Consolidated Coppermines Corp.
NEVADA

FRED O. DAVIS
Potash Company of America
NEW MEXICO

S. H. WILLISTON
Horse Heaven Mines, Inc.
OREGON

GUY N. BJORGE
Homestake Mining Co.
SOUTH DAKOTA

RALPH E. KIRK
Tennessee Coal, Iron & RR Co.
SOUTHEASTERN

GEORGE H. RUPP
Colorado Fuel & Iron Corp.
WALTER E. SCOTT, JR.
Mining Engineer
GEORGE H. TEAL
Cross Gold Mining Co.
HARVEY L. TEDROW
El Paso Mines, Inc.
H. S. WORCESTER
Telluride Mines, Inc.

IDAHO

JOHN D. BRADLEY
Bradley Mining Co.
A. H. BURROUGHS, JR.
Talache Mines, Inc.
HENRY L. DAY
Tamarack & Custer Cons. Mining Co.
A. W. FAHRENWALD
University of Idaho
E. T. FISHER
Warren Dredging Co.
LEO J. HOBAN
Hecla Mining Co.
HAROLD J. HULL
Hull Lease
ROSS D. LEISK
Sunshine Mining Co.
HARRY W. MARSH
Idaho Mining Association
RAY MORRISON
Clayton Silver Mines
T. C. RUSSELL
Anaconda Copper Mining Co.
A. H. SHOEMAKER
Triumph Mining Co.
W. T. SIMONS
Sidney Mining Co.
HOWARD G. WASHBURN
Federal Mining & Smelting Co.

MONTANA

W. R. ALLEN
Bostana Mines
E. R. BORCHERDT
Anaconda Copper Mining Co.
LYMAN BROOKS, JR.
Irma Mines, Inc.
R. B. CAPLES
Anaconda Copper Mining Co.
JOHN H. COLE
Domestic Manganese & Development Co.
R. H. GLOVER
Anaconda Copper Mining Co.
PAUL A. GOW
North Butte Mining Co.
D. M. KELLY
Anaconda Copper Mining Co.
F. A. LINFORTH
Anaconda Copper Mining Co.
K. D. LYNN
Montana Bureau of Mines & Geology
W. E. MITCHELL
Anaconda Copper Mining Co.
P. M. MOSIER
Rademont Mining Co.
ROBERT P. PORTER
Porter Brothers Corp.
JOHN T. POTTS
Victoria Mines, Inc.
H. J. RAHILLY
Anaconda Copper Mining Co.
RENO H. SALES
Anaconda Copper Mining Co.
R. B. SHELLEDY
Montana Phosphate Products Co.
ERNEST J. STANLEY
Emigrant Dredging Co.
A. STROJAN, JR.
Winston Brothers Co.
A. V. TAYLOR, JR.
Taylor-Knapp Co., Inc.
NORMAN THOMPSON
Mike Horse Mining & Milling Co.
FRANCIS A. THOMSON
Montana School of Mines
E. McL. TITTMANN
American Smelting & Refining Co.
CARL J. TRAUERMAN
Mining Association of Montana

NEVADA

J. H. BUEHLER
Bristol Silver Mines Co.
JAY A. CARPENTER
State Bureau of Mines
HOMER GIBSON
Dayton Consolidated Mines Co.
LOUIS D. GORDON
Reno, Nev.
ROY A. HARDY
Getchell Mine, Inc.
W. S. LARSH
Kennecott Copper Corp.
J. J. LILLIE
Mountain City Copper Co.
ALEX McDONALD
International Mining & Smelting Co.
HENRY M. RIVES
Nevada Mine Operators Association
CHARLES H. SEGERSTROM, JR.
Nevada-Massachusetts Co.

NEW MEXICO

T. D. BENJOVSKY
State Bureau of Mines & Mineral Resources
J. B. CARMAN
Molybdenum Corp. of America
T. M. CRAMER
U. S. Potash Co.
ROGER H. DOWNER
New Mexico Miners & Prospectors Association
C. S. ELAYER
American Smelting & Refining Co.
W. H. GOODRICH
Nevada Consolidated Copper Corp.
A. S. WALTER
Consulting & Metallurgical Engineer
IRA L. WRIGHT
Black Hawk Consolidated Mines Co.

OREGON

CLAYTON JONES
Sumpter Valley Dredging Co.
F. W. LIBBEY
State Department of Geology & Mineral Industries
IRVING RAND
Oregon Mining Association
S. R. SMITH
Bonanza Mines, Inc.

SOUTH DAKOTA

N. P. GOODRICH
Bald Mountain Mining Co.
KENNETH C. KELLAR
Kellar & Kellar
CHARLES S. REED
Black Hills Mining Association

RICHARD A. YOUNG
American Zinc Company of Illinois
TEXAS

ELMER ISERN
Eagle-Picher Mining & Smelting Co.
TRI-STATE

OTTO HERRES
Combined Metals Reduction Co.
UTAH

JOHN J. CUBZON
Chelan Division Howe Sound Co.
WASHINGTON

PROGRAM COMMITTEE (Continued)

TEXAS

R. D. BRADFORD
American Smelting & Refining Co.

M. W. HAYWARD
American Metal Co.

UTAH

BURT B. BREWSTER
Mining & Contracting Review

W. H. H. CRANMER
New Park Mining Co.

KUNO DOERR, JR.
American Smelting & Refining Co.

CECIL FITCH
Chief Consolidated Mining Co.

PAUL H. HUNT
Park Utah Consolidated Mines Co.

JAMES IVERS
Silver King Coalition Mines Co.

PERCY H. KITTLE
Ohio Copper Co. of Utah

TOM LYON
International Smelting & Refining Co.

A. G. MACKENZIE
Utah Metal Mine Operators Association

E. S. O'CONNOR
Columbia Steel Co.

WALTER C. PAGE
U. S. Smelting Refining & Mining Co.

MILTON D. PAINE
Tintic Standard Mining Co.

J. D. SHILLING
Utah Copper Co.

WASHINGTON

C. O. DUNLOP
Silver Dollar Mining Co.

WRAY FARMIN
Northwest Mining Association

D. I. HAYES
American Zinc, Lead & Smelting Co.

MAX F. HOLSINGER
Mining World

JENS JENSEN
Pend Oreille Mines & Metals Co.

MILNOR ROBERTS
University of Washington

C. A. SARGENT
Northwest Magnesite Co.

M. H. VAN NUYS
West Coast Mineral Association

FRANK WAGNER
Knob Hill Mines

GEORGE H. WATERMAN
Manufacturers Mineral Co.

TRI-STATE & MISSISSIPPI VALLEY

W. BLAIR BAGGALEY
Northwest Zinc Co.

C. K. BAIN
St. Joseph Lead Co.

O. W. BILHARZ
Bilharz Mining Co.

R. E. CALHOUN
American Zinc, Lead & Smelting Co.

EDWARD L. CLARK
Missouri Geological Survey & Water Resources

F. W. GOOCH
Evans-Wallower Zinc, Inc.

H. A. GRAY
Eagle-Picher Mining & Smelting Co.

BERKLEY JONES
Minerva Oil Co.

JEAN McCALLUM
St. Louis Smelting & Refining Works, National Lead Co.

CHARLES A. NEAL
Atlas Milling Co.

F. F. NETZEBAND
Tri-State Zinc & Lead Ore Producers Association

ALLEN R. REISER
Park City Consolidated Mines Co.

H. G. WEIDMAN
Dines Mining Co.

LAKE SUPERIOR DISTRICT

R. S. ARCHIBALD
North Range Mining Co.

L. P. BARRETT
Jones & Laughlin Steel Corp.

C. J. CALVIN
Great Northern Iron Ore Properties

F. H. CASH
Republic Steel Corp.

A. D. CHISHOLM
Pickands Mather & Co.

WALTER B. CONGDON
Congdon Office Corp.

E. W. DAVIS
Mines Experiment Station, University of Minnesota

E. L. DERBY
Cleveland-Cliffs Iron Co.

RUDOLPH T. ELSTAD
Oliver Iron Mining Co.

RUDOLPH ERICSON
Pittsburgh Coke & Chemical Co.

M. D. HARBAUGH
Lake Superior Iron Ore Association

PERRY G. HARRISON
Evergreen Mines Co.

GROVER LEVEQUE
Interstate Iron Co.

ENDICOTT R. LOVELL
Calumet & Hecla Consolidated Copper Co.

RAY D. NOLAN
Division of Lands & Minerals, Department of Conservation

J. MURRAY RIDDELL
Michigan College of Mines & Technology

GEORGE P. SCHUBERT
Copper Range Co.

FRANK J. SMITH
Montreal Mining Co.

CHARLES J. STAKEL
Cleveland-Cliffs Iron Co.

CARL ZAPFFE
Northern Pacific Railway Co.

EASTERN

F. O. CASE
Anaconda Copper Mining Co.

R. R. ECKERT
U. S. Copper Association

CHESTER A. FULTON
Baltimore, Md.

ERNEST V. GENT
American Zinc Institute, Inc.

F. R. JEFFREY
International Minerals & Metals Corp.

EVAN JUST
Engineering & Mining Journal

JESSE C. MADSON
Jones & Laughlin Ore Co.

E. C. MEAGHER
Texas Gulf Sulphur Co.

R. J. MECHIN
St. Joseph Lead Co

THOMAS G. MOORE
American Metal Co., Ltd.

RUSSELL B. PAUL
New Jersey Zinc Co.

LOUIS WARE
International Minerals & Chemical Corp.

GLOYD M. WILES
National Lead Co.

FELIX E. WORMSER
Lead Industries Association

SOUTHEASTERN

H. A. COY
American Zinc Company of Tennessee

E. B. JENNINGS
Universal Exploration Co.

W. LUNSFORD LONG
Tungsten Mining Corp.

B. H. McCRACKIN
Republic Steel Co.

T. A. MITCHELL
Tennessee Copper Co.

C. F. SCHABER
Dominion Manganese Corp.

MINING EQUIPMENT MANUFACTURERS

W. H. BACHMAN
C. S. Card Iron Works Co.

WILLIAM E. GOODMAN
Goodman Manufacturing Co.

J. G. GREEN
Philco Corp., Storage Battery Div.

OSCAR H. JOHNSON
Mine & Smelter Supply Co.

ARTHUR S. KNOIZEN
Joy Manufacturing Co.

J. J. HUETHER
General Electric Co.

J. ROSENBLATT
Eimco Corp.

J. T. RYAN, JR.
Mine Safety Appliances Co.

R. H. SUMMER
E. I. du Pont de Nemours & Co., Inc.

Entertainment Features

MONDAY EVENING — Buffalo Barbecue—Elitch's Gardens. Dancing and general western entertainment.

TUESDAY NOON — *For the Ladies.* Auto trip to Troutdale-in-the-Pines and Denver's mountain parks.

TUESDAY EVENING — Open. Tickets Available for football game—Green Bay Packers vs. Washington Redskins.

WEDNESDAY NOON — *For the Ladies.* Trip to some of Denver's beautiful gardens.

WEDNESDAY EVENING — Dinner Dance, Broadmoor Club.

THURSDAY EVENING — Annual Banquet.

METAL MINING DIRECTORS

AMERICAN MINING CONGRESS

(Not shown)
NEIL W. RICE

A. E. BENDELARI

WORTHEN BRADLEY

D. A. CALLAHAN

LOUIS S. CATES

ANDREW FLETCHER

V. P. GEFFINE

JAS. R. HOBBINS

H. C. JACKSON

this presentation by legislators of differing views will be of outstanding interest to the mining industry.

Manpower problems will come in for their full share of attention in another session. Claude A. Williams, president, Employers' Council of Texas, will review "Unemployment Compensation in Relation to Manpower Supply." Whiting Williams, one of the outstanding authorities in the United States on the subject of labor relations, will discuss "Selling Mining to the Miner." He will be able to present his topic from a background based upon many years of experience in actual contact with the miner underground. This session will also feature a round table discussion on the subject of "Incentive Wage Plans for Greater Efficiency."

Future Ore Reserves

One session will be devoted to the question of future ore reserves. This topic of vital importance both to the future of mining and the mining communities and to national defense, will doubtless be one of the most instructive of the meeting.

Speakers will be Reno H. Sales, chief geologist, Anaconda Copper Mining Co.; Richard N. Hunt, geologist, United States Smelting Refining & Mining Co.; William E. Wrather, director, United States Geological Survey, and Ira B. Joralemon, consulting engineer, San Francisco.

One of the important post-war developments that may be predicted is the increased use of geophysical prospecting methods. Dr. Louis B. Slichter of the University of Wisconsin, who is one of the outstanding authorities on geophysical methods, will review past methods of geophysical prospecting and give a general picture of the future application of geophysical technique. His discussion will be non-technical in nature and will embrace the essential problems of ore location.

Hon. Joel D. Wolfsohn, acting assistant director, Bureau of Land Management of the Department of the Interior, will discuss present mining laws with reference to location and entry of mineral claims of the Public Domain and the problems which arise in connection with prospecting mineral claims. He will also cover the location of claims by geophysical prospecting and diamond drilling and the protection of the locator in his rights while performing this work.

D. D. MOFFAT

MERRILL E. SHOUP

Mechanization for Greater Productivity

Sessions devoted to operating problems will be held in a special meeting room in the new section of the Auditorium. Emphasis will be placed on mechanization and future trends in labor-saving devices.

One session will feature the use of the newest mechanical mining equipment. For many years the problem of developing machinery for mucking in vertical and incline shafts has been a subject of research by mining engineers and equipment companies. Recently there have been improvements which may simplify mine developments and revolutionize future operations. Experimental work in the use of shaker conveyors in metal mines has reached the stage where efficient results can be anticipated where underground layout is planned for conveyor use. At this session, men who have operated and experimented with this new equipment will present some of their experiences and observations.

Another session will stress underground diesel haulage, a comparatively new development which is attracting considerable attention. Consideration of blasting practice, including use of the shaped charge, open pit haulage, and underground radio communication will be included in this same program.

Other important subjects to be discussed will include "Safety Training for Post-War Mine Operation" and the latest developments in new milling methods.

SEN. ABE MURDOCK
UTAH

SEN. E. C. JOHNSON
COLORADO

SEN. WAYNE MORSE
OREGON

SEN. JOS. H. BALL
MINNESOTA

SEN. JOS. C. O'MAHONEY
WYOMING

PROGRAM

Monday, September 9

Morning Session

THE MINING OUTLOOK

World Economic Problems of Copper, Lead and Zinc
JAMES DOUGLAS, Phelps Dodge Refining Corp.

The Future of Gold
DONALD H. MCLAUGHLIN, Pres., Homestake Mining Company.

The Future of Silver
HON. ABE MURDOCK, U. S. Senator from Utah

Problems of Federal Mine Taxation
HENRY B. FERNALD, Loomis, Suffern & Fernald; Chairman, Tax Committee, American Mining Congress

WELCOMING LUNCHEON

Presiding: MERRILL E. SHOUP, Pres., Golden Cycle Corp.; Chairman, Western Division, American Mining Congress

Welcome to Colorado
HON. BEN F. STAPLETON, Mayor of Denver
HON. JOHN C. VIVIAN, Governor of Colorado

Responses
HOWARD I. YOUNG, Pres., American Zinc, Lead & Smelting Co.; President, American Mining Congress
J. B. HAFFNER, Gen. Mgr., Bunker Hill & Sullivan Mining & Concentrating Co.; Chairman, Program Committee
R. H. PEARSON, Vice Pres., Gardner-Denver Co.; Chairman, Manufacturers Division

Address
HON. EDWIN C. JOHNSON, U. S. Senator from Colorado

Afternoon Session

FEDERAL LABOR LEGISLATION

What Is Needed In A Sound Code of Labor Law?
HON. WAYNE MORSE, U. S. Senator from Oregon
HON. JOSEPH H. BALL, U. S. Senator from Minnesota

Discussion:
ROY H. GLOVER, Western General Counsel, Anaconda Copper Mining Co.
HAROLD J. HULL, Pres., Hull Lease
C. R. KUZELL, Asst. Gen. Mgr., Phelps Dodge Corp.
ROLLA D. CAMPBELL, Huntington, West Virginia
DAVID P. STRICKLER, Pres., Stratton Cripple Creek Mining & Development Co.

Tuesday, September 10

Morning Session "A"

METAL SUBSIDIES—TARIFF POLICIES—STOCKPILING

Administration of the Premium Price Plan
JESSE L. MAURY, Assistant to Price Executive, Metals Branch, Office of Price Administration

Trade Agreements and the "Good Neighbor" Policy in Relation to Imports of Metals
KARL L. ANDERSON, Office of International Trade Policy, State Department

Mineral Raw Materials for Future Security
COL. OMER O. NIERGARTH, Representative of Army and Navy Munitions Board

Industry Viewpoint of Metal Subsidies, Tariffs and Stockpiling
Copper—ENDICOTT R. LOVELL, Pres., Calumet & Hecla Consolidated Copper Co.
EVAN JUST, Editor, Engineering & Mining Journal.

Lead—ANDREW FLETCHER, Exec. Vice Pres., St. Joseph Lead Co.
HENRY L. DAY, Pres., Tamarack & Custer Consolidated Mining Co.

Zinc—O. W. BILHARZ, Mgr., Bilharz Mining Co.
W. C. PAGE, Asst. to Vice Pres. & Gen. Mgr., U. S. Smelting Refining & Mining Co.

Quicksilver—S. H. WILLISTON, Vice Pres., Horse Heaven Mines, Inc.

Tungsten—BLAIR BURWELL, Vice Pres., U. S. Vanadium Corp.

Antimony—JAMES P. BRADLEY, Vice Pres., Bradley Mining Co.

Morning Session "B"

MECHANIZATION FOR GREATER PRODUCTIVITY

Mechanization of Operation in Potash Mining

G. T. HARLEY, Mgr., International Minerals & Chemical Corp.

Discussion:

L. E. YOUNG, Consulting Engineer, Pittsburgh, Pa.

Mechanical Mucking in Shaft Sinking

GEORGE M. GRISMER, Supt., Polaris Mining Co.

Discussion:

J. MURRAY RIDDELL, Head, Dept. of Mng. Engrg., Michigan College of Mining & Technology

Mechanical Mucking in Inclines

CECIL A. FITCH, JR., Asst. Gen. Mgr., Chief Consolidated Mining Co.

Developments in Use of Shaker Conveyors

ROBERT W. THOMAS, Gen. Mgr., Ray Mines Div., Kennecott Copper Corp.

Discussion:

JACK STILL, Mine Supt., Miami Copper Co.

Tuesday Afternoon

Inspection of Exhibits

Wednesday, September 11

Morning Session "A"

LABOR AND MANPOWER PROBLEMS

Unemployment Compensation in Relation to Manpower Supply

CLAUDE A. WILLIAMS, Pres., Employers' Council of Texas

Selling Mining to the Miner

WHITING WILLIAMS, Industrial Relations Consultant, Cleveland, Ohio

Incentive Wage Plans for Greater Efficiency—Round Table Discussion

W. H. H. CRANMER, Pres., New Park Mining Co.
A. H. BEBEE, Vice Pres., Golden Cycle Corp.
S. S. CLARKE, Gen. Supt. of Mines, Eagle-Picher Mining & Smelting Co.
S. H. WILLISTON, Vice Pres., Horse Heaven Mines, Inc.
F. O. DAVIS, Treas., Potash Company of America

Morning Session "B"

ADVANCES IN MINING PRACTICE

Diesel Haulage in Underground Mines

Trucks:

S. S. CLARKE, Gen. Supt. of Mines, Eagle-Picher Mining & Smelting Co.

Locomotives:

C. W. PLUMB, Gen. Mgr., Idarado Mining Co.

Discussion:

L. E. YOUNG, Consulting Engineer, Pittsburgh, Pa.

Developments in Underground Drilling and Blasting Practice

WILLIAM T. WARREN, Gen. Supt., National Tunnel & Mines Co.

Discussion:

E. R. BORCHERDT, Research Engr., Anaconda Copper Mining Co.

Truck Haulage, Castle Dome Open Pit

B. R. COIL, Gen. Supt., Miami Copper Co.

Two-Way Radio Communication in Shafts

C. N. KRAVIG, Asst. Mine Supt., and
REX TARIO, Elec. Engr., Homestake Mining Co.

Discussion:

J. H. HEDGES, Chief, Tucson Div., Mining Branch, U. S. Bureau of Mines.

Special Luncheon

Presiding: HORACE M. ALBRIGHT, Vice Pres., United States Potash Company.

Address

HON. J. A. KRUG, Secretary of the Interior

Introduced by the HON. JOS. C. O'MAHONEY, U. S. Senator from Wyoming.

Wednesday Afternoon

Inspection of Exhibits

Thursday, September 12

Morning Session "A"

DEVELOPING ORE RESERVES FOR THE FUTURE

Ore Reserves and Future Exploration

RENO H. SALES, Chief Geol., Anaconda Copper Mining Co.

How the U S. Geological Survey May Serve the Mining Industry

RICHARD N. HUNT, Geol., U. S. Smelting Refining & Mining Co.

Role of the U. S. Geological Survey in Mineral Exploration

WILLIAM E. WRATHER, Director, U. S. Geological Survey

Canadian Treatment of Mining Ventures

IRA B. JORALEMON, Consulting Engineer, San Francisco, Calif.

Morning Session "B"

DEVELOPMENTS IN MILLING AND SAFETY

New Things in Milling Practice

STUART R. ZIMMERLEY, Chief, Salt Lake City Div., Metallurgical Br., U. S. Bureau of Mines.

Safety Training for Post-War Mine Operation

A. H. ZEILINGER, Safety Engr., Colorado Fuel & Iron Corp.

Discussion:

EDWIN J. EISENACH, Safety Engr., Climax Molybdenum Co.

Afternoon Session

Current Status and Potentialities of Geophysical Prospecting

DR. LOUIS B. SLICHTER, Professor of Geophysics, University of Wisconsin

Public Land Policies in Relation to Mining

JOEL D. WOLFSOHN, Acting Assistant Director, Bureau of Land Management, Department of the Interior

Discussion: (PROPOSED GEOPHYSICAL MINING CLAIMS ACT)

W. C. BROADGATE, Technical Consultant, U. S. Senate Small Business Committee

Stockholders As a Public Relations Medium

LEO J. HOBAN, Treas., Hecla Mining Co.

Discussion:

TOM LYON, Asst. to Mgr., International Smelting & Refining Co.

Thursday Evening

Annual Banquet

Krug Will Address Special Luncheon

On Wednesday, September 11, a special luncheon will be addressed by the Honorable J. A. Krug, Secretary of the Interior of the United States. Mr. Krug will be introduced by Senator Joseph C. O'Mahoney of Wyoming, leading member of the Senate Committee on Public Lands. In view of the demands on mineral deposits throughout the United States during the period of war, Secretary Krug is greatly interested in the problem of augmenting present reserves by a program of exploration.

Program for the Annual Banquet on Thursday evening, September 12, will be announced at the Convention.

Those who attend the convention should not miss the opportunity of taking a vacation in the State of Colorado. There are few localities in the United States that offer a greater variety of scenery and to those who are interested in sports, Colorado trout fishing is of course famous. For those more strenuously inclined there is horseback riding and mountain climbing and finally the pleasure of visiting in a city as pleasant and cordial as Denver.

JULIAN D. CONOVER
Secretary

MEMBERS of AMERICAN MINING CONGRESS STAFF

P. D. McMURRER
Assistant to the Secretary

A. W. DICKINSON

J. W. FEISS
Editor
Mining Congress Journal

HARRY L. MOFFETT

WESTERN DIVISION

THE AMERICAN MINING CONGRESS

MERRILL E. SHOUP, Chairman
Pres., Golden Cycle Corp.

Board of Governors

AL ANDERSON, Secy., Alaska Miners Assn.
P. G. BECKETT, Vice Pres., Phelps Dodge Corp.
GUY N. BJORGE, Vice Pres.-Gen. Mgr., Homestake Mining Co.
R. D. BRADFORD, Mgr., American Smelting & Refining Co.
P. R. BRADLEY, Chairman of the Board, Alaska Juneau Gold Mining Co.
WORTHEN BRADLEY, Pres., Bradley Mining Co.
WILLIAM C. BROWNING, Gen. Mgr., Golden Queen Mining Co.
J. J. CARRIGAN, Gen. Mgr., Anaconda Copper Mining Co.
WILLIAM J. COULTER, Gen. Mgr., Climax Molybdenum Co.
JOHN J. CURZON, Gen. Mgr., Chelan Division, Howe Sound Co.
FRED O. DAVIS, Treas., Potash Company of America
ROY B. EARLING, Vice Pres. & Gen. Mgr. Oper., Fairbanks Dept., U. S. Smelting Refining & Mining Co.
WRAY D. FARMIN, Pres., Northwest Mining Assn.
N. P. GOODRICH, Acting Mgr., Bald Mountain Mining Co.
HAMILTON A. GRAY, Vice Pres., Eagle-Picher Mining & Smelting Co.
L. E. HANLEY, Pres., Hecla Mining Co.
R. A. HARDY, Cons. Engr. in Charge, Getchell Mine, Inc.
M. W. HAYWARD, Cons. Engr., American Metal Co.
J. C. KINNEAR, Vice Pres. in Chg. of Western Operations, Kennecott Copper Corp.
ROSS D. LEISK, Gen. Mgr., Sunshine Mining Co.
A. G. MACKENZIE, Vice Pres., Utah Metal Mine Operators Assn.
HARRY W. MARSH, Secy., Idaho Mining Assn.
HORACE MOSES, Gen. Mgr., Chino Mines Div., Kennecott Copper Corp.
CHARLES A. NEAL, Atlas Milling Co.
F. F. NETZEBAND, Acting Secy., Tri-State Zinc & Lead Ore Producers Assn.
T. H. O'Brien, Vice Pres., Inspiration Consolidated Copper Co.
W. C. PAGE, Asst. to Vice Pres.-Gen. Mgr., U. S. Smelting Refining & Mining Co.
ROBERT S. PALMER, Secy, Colorado Mining Assn.
IRVING RAND, Vice Pres. & Secy., Oregon Mining Assn.
HENRY M. RIVES, Secy., Nevada Mine Operators Assn.
J. D. SHILLING, Asst. Gen. Mgr., Utah Copper Co.
S. R. SMITH, Pres., Bonanza Mines, Inc.
HARVEY L. TEDROW, Gen. Mgr., El Paso Mines, Inc.
FRANCIS A. THOMSON, Pres., Montana School of Mines
CARL J. TRAUERMAN, Secy.-Treas., Mining Association of Montana
H. E. TREICHLER, Gen. Mgr., Texas Gulf Sulphur Co.
F. C. VAN DEINSE, Vice Pres.-Gen. Mgr., Yuba Consolidated Gold Fields
G. H. WATERMAN, Pres., Manufacturers Mineral Co.
CHARLES F. WILLIS, State Secy., Arizona Small Mine Operators Assn.
S. H. WILLISTON, Vice Pres., Horse Heaven Mines, Inc.
IRA L. WRIGHT, Gen. Mgr., Black Hawk Cons. Mines Co.

EXPOSITION PREVIEW

FOR THE first time since 1941, mining men have the opportunity to see a complete display of modern machinery and equipment for all phases of mining and milling operations. This year's meeting marks the resumption of exhibits in connection with the Mining Congress Convention, and manufacturers are taking advantage of the opportunity to show the industry all the new developments of the war period. With attention focused on higher efficiency, increased safety and lower production costs, all who come to Denver will want to inspect the Exposition thoroughly and to check up on all the new machinery and equipment.

Some 80 leading manufacturers will be represented on the Exposition floor, all set to demonstrate their equipment and explain their services. Somewhere in this great array of modern mining equipment the operator is certain to find the answer to many production problems. The mining man who is interested in new machines or in rebuilding or repairing old ones, or who is interested in the latest "know how" on adapting various equipment and supplies most advantageously to a particular mining or milling problem, will find the answer in the exhibits or through discussion with some of the exhibitors' trained personnel.

There will be four full days at Denver to inspect all the exhibits, to compare machines and operating performance and to decide on what is best for a specific task. It is impossible to present a complete story on the displays, but the following brief descriptions will give some idea of the comprehensive scope of the Exposition.

• ALLEN-SHERMAN-HOFF CO.

Featuring a pictorial presentation of Hydroseal pumps in use for long-distance pumping. The illustration will show the pump can convey material over almost any terrain for considerable distances and the pipe line will be seen in many difficult installations to indicate typical tailings disposal job.

One of the new, improved Hydroseal pumps of A-Frame size, as well as the shaft and bearing assembly, will be part of the exhibit.

• ALLIS-CHALMERS MFG. CO.

Equipment of special interest will be an exploded scale model of the Solids-Handling pump—a pump capable of handling up to 40 per cent solids in suspension—and an operating unit of the Vari-Pitch Speedchanger which, with push-button or manual control, provides up to 300 per cent speed variation for V-belt driven machines. A unique feature of the exhibit will be a large, colored flow sheet illustrating how basic processing machinery is utilized in the concentration of ores. *In charge—H. A. Reinhard.*

• ALLOY STEEL & METALS CO.

Will display a representative line of Pacific Products, and feature a series of enlarged photographs of Pacific jaw crushers. Equipment on display will include Alloy's standard line of Pacific sheave blocks and the new "C" type all-manganese sheave blocks; the new 30-in. "A" type Pacific slushing scraper; a 16-in. tail block sheave assembly; a 19-in. diamond block assembly; the G-8 Pacific gas-driven rock bit grinder and other miscellaneous products. Literature covering the entire Pacific line will be available at the booth. *In charge—John McKean.*

• AMERICAN BRATTICE CLOTH CORP.

Mine vent flexible ventilation tubing, in four grades illustrating the qualities of each, will be the feature of this exhibit. A display of mine vent detachable couplings will emphasize the advantages over old-type sewn in couplings; ABC jute brattice cloth, in different grades, will also be shown. *In charge—D. B. Mikesell.*

• **AMERICAN MANGANESE STEEL DIVISION, AMERICAN BRAKE SHOE COMPANY**

This exhibit will consist of a representative group of cast manganese steel products as used in the metal mining industry; a special manganese steel ball mill grate; Amsco welding products for hardfacing and reclamation of mining equipment wearing parts, and an Amsco-Nagle pump for handling mining tailings, and similar matter.

• **ANACONDA WIRE & CABLE CO.**

Will feature a very heavy power cable, known as Type VCLJW, used extensively in mining properties. *In charge —E. A. Casey.*

• **ATLAS POWDER COMPANY**

Atlas will stress its new rockmaster system of blasting. The rockmaster system includes the use of a newly developed manasite detonator, together with Atlas explosives especially selected and loaded to meet individual requirements of each job. *In charge—R. K. Gottshall.*

• **THE BROWN-FAYRO COMPANY**

Outstanding feature of this exhibit will be the Model HKM car spotting hoist, the latest Brown-Fayro machine for the handling of mine cars in connection with mechanical loading systems. This hoist is rated at 6,000 lbs. rope pull at 25 ft. per minute and is provided with a 5-hp. motor with suitable control equipment for this service. In addition, the Model BC tubing blower and the "Brownie" rerailer, in various sizes and weight, will be a part of the display. These rerailers are made to fit various track sizes and are generally carried in sets on each locomotive.

• **BUCYRUS-ERIE COMPANY**

No description available.

• **THE C. S. CARD IRON WORKS CO.**

Will exhibit several cars, track work, rope rollers and sheaves, wheels and trucks, and replicas of a large number of special designed cars. *In charge—W. H. Bachman and Charles W. DeLong.*

• **CHICAGO PNEUMATIC TOOL COMPANY**

This display will consist of rock drills (sinkers, stopers, and motordrifters), diamond drills, demolition tools, pneumatic and electric tools. The feature attraction will be the 3½-in. bore CP-60N rotor-drifter. Also on exhibit will be the CP No. 5 diamond drill used extensively in coring and blast-hole diamond drilling. *In charge—P. G. Swanson.*

• **CLEVELAND ROCK DRILL DIVISION**

(The Cleveland Pneumatic Tool Company)

Featured in its exhibit will be the new drifter, the "Gray Rocket," 3½-in. machine which has been in development and experimental stage during the war. Also to be shown is Cleveland's line of handsinkers and stopers, augmented with a representative display of air line lubricators and valves designed for the mining industry. *In charge—A. H. Hruby.*

• **COFFING HOIST COMPANY**

Will feature its new combination hoist and jack, a tool which has been in the process of development during the past three years. Because of its widespread application it is claimed to be one of the most outstanding developments in the field of modern "all around" utility tools. *In charge—J. R. Coffing.*

• **COLORADO BUILDERS' SUPPLY COMPANY**

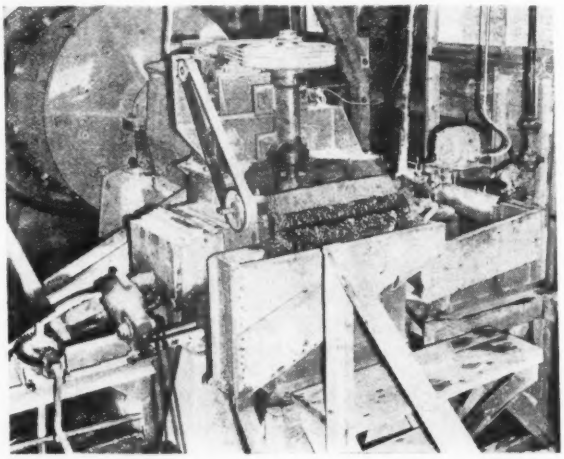
No description available.

• **COLORADO FUEL & IRON COMPANY**

No description available.

• **DENVER EQUIPMENT COMPANY**

Actual operation of commercial size Denver "Sub-A" unit flotation cell and Denver mineral jig will be the feature of this exhibit. These units will demonstrate the



application and value of flotation and gravity concentration in closed grinding circuits to "recover the mineral as soon and as coarse as possible."

• **THE DENVER FIRE CLAY COMPANY**

Will feature a DFC electric assay furnace with automatic temperature control. Also on display will be DFC laboratory crushers, pulverizers, samplers, cupel machines, clay goods, refractories and burners.

• **DIFFERENTIAL STEEL CAR COMPANY**

No description available.

• **E. I. DU PONT DE NEMOURS & COMPANY**

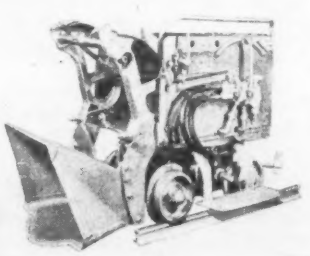
Will display its line of electric blasting caps at Booths 120 and 122. The new caps are equipped with nylon-insulated lead wires and rubber plug closures. These exclusive features offer many advantages to users and details can be secured by visiting the display. Explosives for metal mining will also be shown, as well as the new aluminum blasting cap recently placed on the market by du Pont.

• **THOS. A. EDISON, INC.**

Will display a mural of typical metal mining trammer and the battery for such a locomotive. Cutaway cells in types and sizes typical of those used in the assembly of metal mine locomotive batteries will be included in the exhibit, together with a display board showing the structural parts of a cell. *In charge—R. H. Weeks and F. C. Gibson.*

• **THE EIMCO CORP.**

Will show one or two rocker shovels, together with views of the machine operating in the Leadville Tunnel, at Leadville, Colo. *In charge — Ewald Kipp and D. W. Saunders.*



• THE ELECTRIC STORAGE BATTERY COMPANY

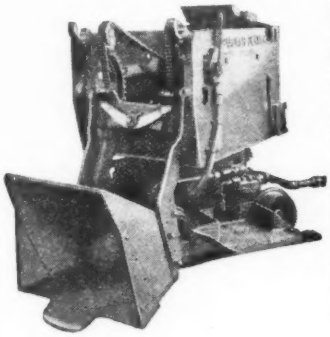
Will exhibit various sizes and types of Exide-Ironclad cells as used in mine locomotives and shuttle cars. *In charge—J. N. Rosholt.*

• ENGINEERING AND MINING JOURNAL

Exhibit will consist chiefly of charts. Ample space is being provided to sit and visit. *In charge—H. R. Mathias.*

• GARDNER-DENVER COMPANY

Will feature its new GD-14 mine car loader, a companion model of the GD-9, which has been designed to supplement the latter in installations where wider clean-up width is desired and larger cars are to be loaded. In addition the exhibit will include their complete line of stopers, sinkers, crank feed and automatic feed drifting drills, drill steel sharpening equipment, five-cylinder radial air motors in sizes of 3 hp. to 15 hp., single drum air hoist, airslushers, and line oilers. Also shown will be a complete line of paving breakers featuring new post-war Model No. B87, and spaders, trench diggers, and backfill tampers. *In Charge—C. J. Manley.*



• THE GATES RUBBER COMPANY

This exhibit will display Gates V-belt power transmissions for mine use and the Gates line of hoses specifically designed for the mining industry. Mechanical rubber goods for use in the mining field will also be shown.

• THE GENERAL ELECTRIC COMPANY

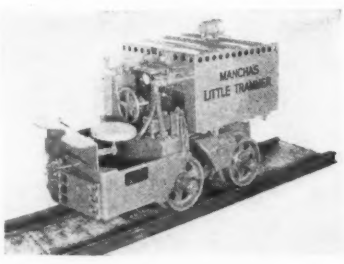
A four-ton, open type, gathering mine locomotive will feature this exhibit. Shown will be the new, totally enclosed Tri-Clad motor, that was especially designed for use in extremely dusty and dirty atmospheres. Of Special interest will be General Electric's centralized control equipment, Cabinetrol. This unit is standard but flexible enough to solve special control problems. *In charge—Kent Thomas.*

• GIBRALTAR EQUIPMENT & MANUFACTURING COMPANY

No description available.

• GOODMAN MANUFACTURING COMPANY

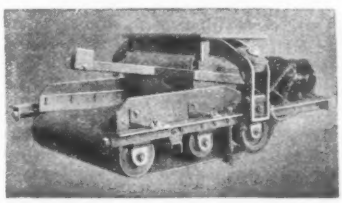
Will display a G-20 shaker conveyor drive with motor and connecting or drive trough attached. This type of equipment has been successfully applied to the several systems of mining such as stoping, block caving, room work and in back filling. Installations at present are in copper, hematite, potash, borox, and salt. The rapid extraction they have afforded has removed the dangers from too rapid caving and consequently reduced timber costs.



The Mancha Storage Battery Locomotive Division of Goodman will exhibit Mancha's Little Trammer Locomotive. This small locomotive is in active use in metal mining districts the world over. *In charge—J. D. James.*

• HARDINGE COMPANY

Will exhibit various types of equipment, with emphasis on the Hardinge conical mill and air classifier for use in dry grinding of ores, minerals, and even metals. This development of mill and air classifier has found wide application in industry, particularly where the specifications must be held within close limits as to fineness and character of product secured. Featured also will be the standard Hardinge conical ball and rod mill for the wet grinding of ores. The Ruggles-Coles dryer will be shown in working model form, which dryer is extensively used for the drying of coal, ores, chemicals, and other materials. Two new products, the BLM "Auto-Centri" clutch and the automatic backwash sand filter (the latter in a lighted drawing), will also be exhibited. *In charge—G. A. Wallerstedt and R. C. Ferguson.*



• HARNISCHFEGER CORPORATION

A model working exhibit of the P & H magnetorque unit as used on electric mining shovels will be displayed. Visitors will be able to see exactly what the unit is and how it functions.

• HELD & McCOY MACHINERY CO.

Will display a caterpillar diesel electric set.

• HENDRIE & BOLTHOFF MANUFACTURING AND SUPPLY CO.

No description available.

• HERCULES POWDER COMPANY

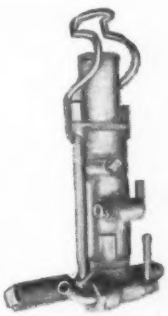
No description available. *In charge—M. R. Budd.*

• THE HUMPHREYS INVESTMENT COMPANY

The engineering division of this firm will exhibit the Humphreys spiral concentrator. Also on display will be a closed circuit test unit, including a spiral of commercial size connected and operating with feed so that the operation of the machine and the products produced can be readily seen.

• INDEPENDENT PNEUMATIC TOOL COMPANY

The "Thor" exhibit will feature a complete display of the company's line of drifter, stoper and sinker rock drills in all weight classifications, plus other "Thor" pneumatic and electric tools adapted to mine use. Among the new "Thor" products to be shown for the first time will be 30- and 39-lb. sinkers, two exceptionally light weight machines for top rock drilling.



• INGERSOLL-RAND COMPANY

As 1946 is the 75th anniversary of this firm the theme of their exhibit will be "75 Years of Service to the Mining Industry." Of unusual interest to many mining men will be the display of a number of old rock drills, including the company's earliest models manufactured in 1871.

The exhibit will also feature several new rock drills and mountings. There will be an extensive display of "Jackbits" and reconditioning equipment for these detachable

bits, including hot millers, grinders, cut-off machines, etc. Various types of air and electric slusher hoists will be on the stand as well as other types of air hoists and air tools for use under and above ground. A 6-stage centrifugal station pump will be shown. The upper casing will be raised so as to expose the interior construction and design.

• INTERNATIONAL DERRICK & EQUIPMENT COMPANY

Steel buildings that should be of interest to mining men will be shown in the Ideco booth. Two types of structures are to be exhibited. Full scale buildings of small size will be used. One type building, the "continuous column and rafter" or "rigid bent" will show a design that is gaining popularity. This style structure has all supporting members near the roof lines and provides extreme head room for large equipment. The second type is a "stressed-skin" design that uses the strength of the steel sheets for main support. No columns or trusses are used in these buildings and only a minimum of steel structurals are required. *In charge—L. R. Wells and S. E. Wilson.*

• THE INTERNATIONAL NICKEL COMPANY, INC.

A major portion of this exhibit will be devoted to a display of Ni-Hard castings used in the mining industry to obtain improved resistance to wear and abrasion.

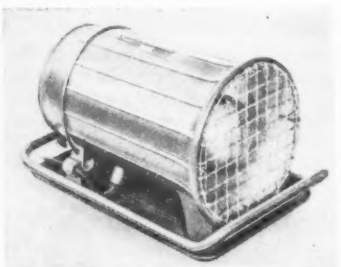
In addition to the Ni-Hard castings, the important applications of the nickel alloy steels will also be featured.

• RICHARD IVES COMPANY

Will feature Le Blond regal lathes of various sizes equipped with both feed screw and feed rods, reversing motor, control switch, large and small face plates, taper spindle sleeve, adjustable thread cutting stop, etc.

• THE JEFFREY MANUFACTURING CO.

The improved design Jeffrey permissible aerodyne midget blower for alternating current will be on display and operated for short intervals. Thus can be demonstrated the volume of air moving at high velocity through flexible tubing with a 1½-hp., 3,450 r.p.m. motor. This unit is constructed with an aluminum housing mounted on a rugged welded steel skid pan base with convenient handles to facilitate moving the unit from place to place.



Also in operation will be four Jeffrey Traylor electric vibrating feeders operating in a closed circuit. This electric vibrator is designed in sizes from small re-agent feeders up to run-o-mine ore feeders handling 2,000 tons per hour.

• JOY MANUFACTURING COMPANY

Two entirely new products of the Sullivan Division will be exhibited—a midget air winch said to replace manual work in many places throughout mines, and a hydraulically operated drill jumbo known as the "hydro-drill-jib." Other new products will be a La-Del portable blower of the axial-flow type and a shaker conveyor designed specifically for metal mines. Enlarged colored pictures will feature the newest equipment in Joy shuttle cars and Joy mobile loaders for the metal and non-metallic mines. *In charge—R. E. Campbell.*

• A. LESCHEN & SONS ROPE COMPANY

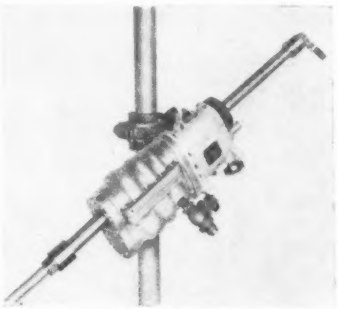
This display will consist of numerous samples of various types and constructions of wire rope used in the metal mining industry. These will be short in length to permit of easy examination and comparison. The decorative part of the exhibit will be a large revolving reel of "HERCULES" (Red-Strand) wire rope, especially illuminated.

• LINK-BELT COMPANY

No description available.

• E. J. LONGYEAR COMPANY

Will feature two diamond drills. The Junior Straitline drill is used for exploration core drilling of moderately deep holes from surface or underground, and is representative of the Longyear Straitline drills with higher and lower capacities. The new gopher drill with its powerful air motor is designed for blast hole drilling. Display boards will illustrate the company's integrated services to the mining industry — manufacture of diamond drills and supplies, contract core drilling, geological services, shaft sinking, mine development and consulting mining engineering.



• MACK-INTERNATIONAL TRUCK CORPORATION

No description available.

• MARION POWER SHOVEL COMPANY

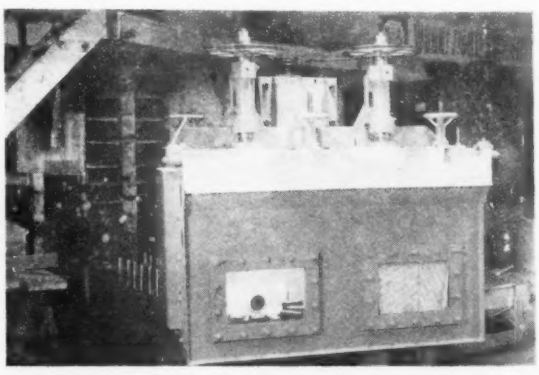
This exhibit will consist of a built-up display showing a shovel loading ore in an open pit mine. It will be illuminated to bring out the high lights not only of the shovel, but of the entire job. *In charge—L. C. Mosley.*

• MINE SAFETY APPLIANCES CO.

Will show its great variety of standard equipment for mine and industrial safety as well as several entirely new products. These include: the M.S.A. Chemox self-contained, self-generating oxygen breathing apparatus; a new "Comfo" cushioned facepiece for M.S.A. dust, metal fume, paint and air line respirators; the Redi-Heat block providing ready heat at any time and anywhere within 60 seconds; and a rail punch for 110-lb. rail. Heretofore 40-lb. rail was the largest size which could be punched by this portable tool.

• THE MINE AND SMELTER SUPPLY COMPANY

Will display Massco-Fahrenwald flotation machines, a 2-cell, 28-in. unit. The separated feed principles is one of the unusual features of the design of this new machine.



The separation of pulp feed and air feed at different points on the flotation impeller has increased aeration and agitation, and results in faster metallurgy and reduced power as compared to previous gravity fed machine. This machine is designed to allow complete flexibility in operating requirements and can be operated with individual cell control or used as a hog trough machine.

• MINING RECORD

No description available.

• MINING WORLD

Will have on display copies of the magazine.

• MORSE BROS. MACHINERY COMPANY

Will exhibit a 12-in. wide by 6-ft. long Morse "Vari-Stroke" ore feeder and a Morse "Trueline" classifier. *In charge—Harold Grimes and Paul Wigton.*

• NATIONAL MALLEABLE AND STEEL CASTINGS CO.

The main theme of this exhibit relates to parts for the construction of mine cars, and will include plain and swivel hitchings and various sizes and types of wheels.

Featured will be several assemblies of Willison automatic couplers as applied to mine cars. These assemblies will include spring-type and friction-type draw gear applications. The couplers will illustrate the self-centering feature and also demonstrate designs which allow dumping of cars on rotary tipples.

Various other special hauling devices will be displayed as well as an assortment of alloy steel grinding balls.

• NORDBERG MANUFACTURING CO.

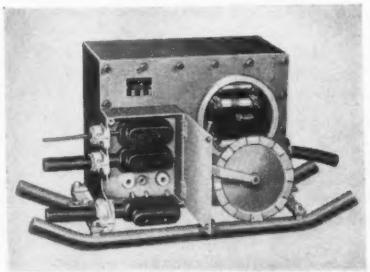
Plans to exhibit an intermediate Symons cone crusher and a Symons rod deck screen. The crusher and its driving motor will be mounted on a steel base making this a completely self contained unit. Both the crusher and screen will be in operation. *In charge—Delbert Kay.*

• NORTHWEST ENGINEERING COMPANY

Because of the excessive size of excavating equipment, this firm will use photographs for its display and a series of pictures will indicate the use of the equipment. *In charge—J. L. Farrell and G. C. Williams.*

• OHIO BRASS COMPANY

This exhibit will feature two safety and control devices—the Type BD motor starter and the Type LG permissible distribution box—in addition to its line of overhead trolley and feeder materials, rail bonds and locomotive equipment. Offering positive control and protection for conveyor drives and other motor-driven equipment, the Type BD motor starter embodies an improved timing arrangement—compensated counter EMF—which assures smooth, even starting regardless of load. The Type LG distribution box, enclosed within a flame-tight case, provides a portable means of distributing power to mechanical equipment in working areas. From one long trailing cable, it will accommodate up to three branch circuits, each individually fused to meet the requirements of the machine it powers. *In charge—J. H. Sanford.*



• OWENS-CORNING FIBERGLAS CORPORATION

This exhibit has been designed to show the completeness of Fiberglas electrical insulation materials, to demonstrate the basic characteristics of Fiberglas which make it adaptable to electrical uses, and to display actual stator and rotor assemblies partially completed with Fiberglas materials installed. *In charge—R. J. Black.*

• PETTIBONE MULLIKEN CORPORATION

The equipment to be shown in this exhibit will be diamond alloy centrifugally cast slurry pumps, a dragline bucket, manganese steel castings, and various diamond alloy castings. *In charge—W. N. Miller.*

• PHILCO CORPORATION

The Philco "Thirty" will be the feature of Philco Corporation's exhibit. This extra capacity battery has the reserve power to climb grades and complete the shift in high. *In charge—J. A. Gilruth.*

• A. J. PHILPOTT CO.

Featuring products of Atlas Car & Mfg. Co., and Marlow Pump Co.

• READY-POWDER COMPANY (Power Plant Division)

No description available.

• ROBINS CONVEYORS INCORPORATED

No description available. *In charge—A. E. Conover and E. P. Larsen.*

• JOHN A. ROEBLING'S SONS COMPANY

No description available.

• ROTARY STEEL CASTING COMPANY

Will exhibit with National Malleable and Steel Castings Company. The display will consist of a representative number of grinding balls, which are manufactured by a rotary process.

• SHEFFIELD STEEL CORPORATION

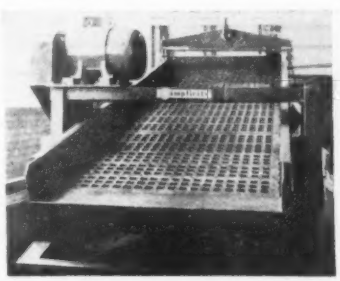
Display will consist of a pyramid of grinding balls in various sizes, and other samples of Sheffield products.

• THE SIGHT FEED GENERATOR COMPANY

Will have on display several acetylene generators completely equipped, ready for welding. Their operation will be demonstrated.

The Miller Electric Manufacturing Company, a subsidiary, will have a very complete exhibit of Miller A-C arc welders. Several demonstrations of these welders will be given and those interested are invited to get the "feel" of a Miller. There will also be a demonstration of the uses and applications of Rexarc overlay electrodes. These electrodes operate equally well on either A-C or D-C welders.

• SIMPLICITY ENGINEERING COMPANY



Expects to show a heavy duty 3-ft. x 8-ft. Model "BG" scalping unit. These scalpers are used in place of stationary grizzlies to scalp boulders up to 5 or 6 ft. in diameter. A number of them are in service in various iron mining operations and are of value in many mining operations. *In charge—R. C. Johnson.*

• J. K. SMIT & SONS, INC.

The JKS exhibit will consist of coring bits ranging in size from EX bits to the largest bits used in mining and construction. A complete assortment of non-coring bits will be shown in both HARD-HED and HI-CASTE matrices. Their new FERRET type diamond impregnated coring bit will also be shown. Recently introduced, the FERRET bit has given very satisfactory results under difficult drilling conditions. *In charge—John F. Stark.*

• SOCONY-VACUUM OIL COMPANY

No description available.

• W. O. & M. W. TALCOTT, INC.

This company will exhibit sample joints and fasteners for both heavy transmission and conveyor belting made of the regular Talcott belt fasteners which have been known throughout the mining industry. *In charge—M. W. Talcott.*

• THE TAMPING BAG COMPANY

Will feature the Dummy Maker machine, with demonstration as to operating methods and time-saving features. This machine fills and packs tamping bags with inert material for use as dummies in blasting operations, and effects a large saving in man-hours on this job. Samples of the new Super-Sealtite tamping bags will be furnished to all interested parties. *In charge—Alfred E. Pickard.*

• THE TEXAS COMPANY

No description available.

• TIMKEN ROLLER BEARING COMPANY

An attractive layout of removable rock bits will feature this display, as well as a large map of the United States with illuminated plastic bits showing the distribution of their usage. *In charge—Yale Hills.*

• TRAYLOR ENGINEERING & MANUFACTURING COMPANY

Enlarged photographs of several installations of the latest types of Traylor metallurgical machinery constitute this display. No special piece or type of equipment is featured but selected representative photos show a few of the many products designed and built for the mining industry and typical of other industries.

• THE W. S. TYLER COMPANY

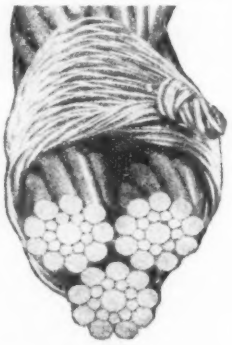
This exhibit will feature a scale model of the Ty-Rock screen in action. There will also be a selection of Tyler standard screen scale testing sieves and a large number of woven wire screens of the many different types used in the mining industry.

• ULTRA-VIOLET PRODUCTS, INC.

On exhibit will be a display of 12 different MINERALIGHT models of short wave ultra-violet fluorescent analysis lamps. In addition, there will be specimens of rocks and minerals that have a fluorescent response to ultra-violet lamps. Particular emphasis will be placed on commercial ores such as scheelite (an ore of tungsten), uranium, and zircon. *In charge—Thomas S. Warren.*

• UNION WIRE ROPE CORPORATION

Union's exhibit will include wire rope transparencies showing different constructions and lays of rope, a novel wire rope meshing clock, and actual samples. On hand will be literature and samples of Union "Tuffy" mining machine, crab motor and winch ropes. The new ⅝-in. 3 x 19 slusher rope will also be shown. This rope is so engineered that it gives the maximum resistance to chert abrasion, is rigid and non-collapsing to eliminate drum crushing, while retaining adequate elasticity and flexibility to take up shock loads and operate over undersize sheaves.



• VICTAULIC COMPANY OF AMERICA

Will display its complete line of Victaulic pipe couplings, ranging from ¾-in. through 60-in. diameter, and its modern full-flow elbows, tees, reducers, and accessories for the installation and operation of compressed air, water supply, drainage, and all other types of pipe systems. Operating units carrying air and water pressure will demonstrate the speed, simplicity, flexibility, and leak-tightness of Victaulic jointing.

• VULCAN IRON WORKS COMPANY

Plans to exhibit a small gasoline driven hoist, one electric portable timber saw and one rubber rope roller. *In charge—G. H. Denton, Jr.*

• WESTERN MACHINERY COMPANY

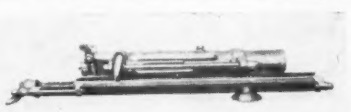
The display will consist of a large map showing the location of the mills which have been designed, engineered, and/or constructed by Western-Knapp Engineering Co., a division of Western Machinery Co. Each of these locations on the map will be numbered to coincide with numbers on a selector wheel, and around the outside of this wheel will be buttons with the names of the plants that are represented by the numbers on the wheel and on the map. This is to be a guessing game with prizes. The wheel will be spun for the participants and then he must select the right name designated by the number on the wheel. If he pushes the right button along side the name he selects, that area will light up on the map (and in some cases light the picture of that mill).

• WILLSON PRODUCTS, INC.

No description available.

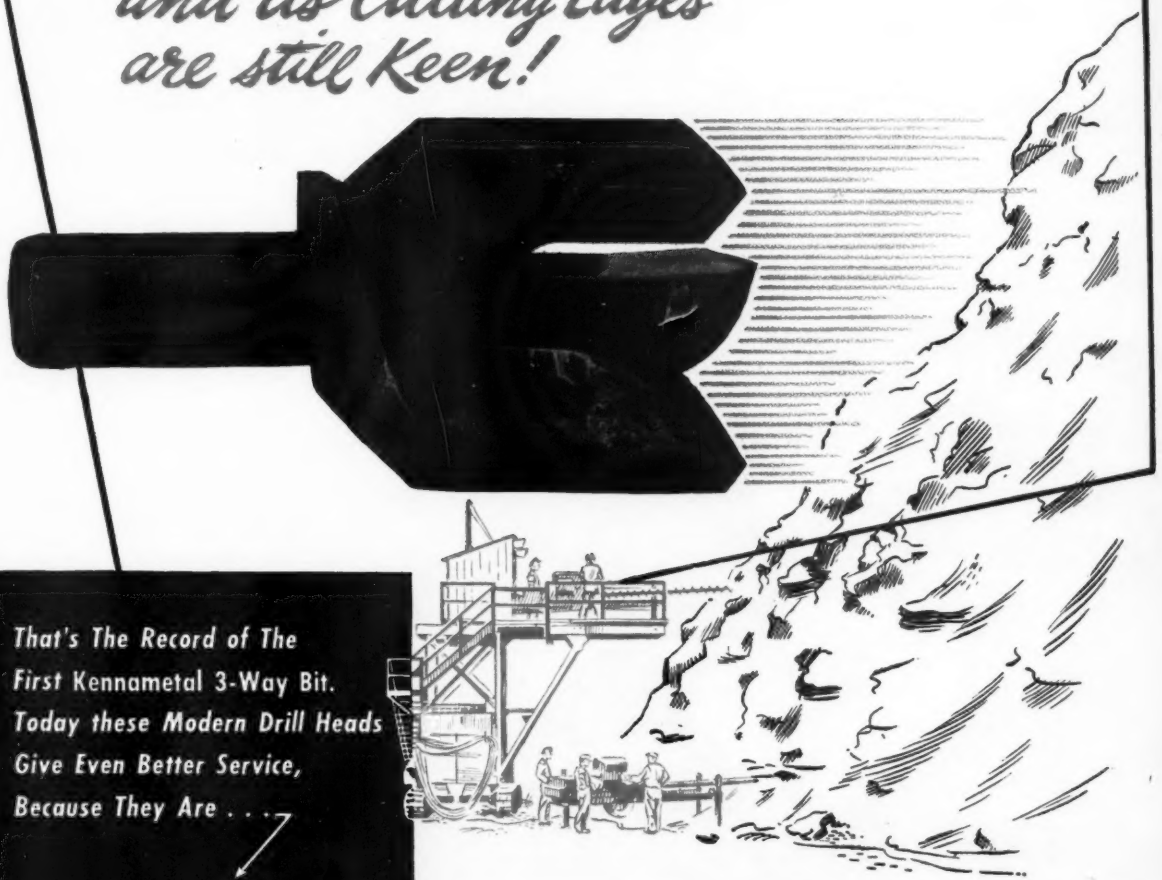
• WORTHINGTON PUMP AND MACHINERY CORPORATION

Blue Brute drifters will be announced at the exposition. The result of several years of experimental and development work as well as severe field tests under all conditions, the new Blue Brutes are being shown in 3-in., 3½-in., and 4-in. sizes. Of especial interest is the fact that all three sizes are being shown with hand crank or motor feed, and the motor feed models are exhibited with the motor located optionally either on the feed shell or on the drifter. The Blue Brute stoper, the medium weight, self-rotating model, an addition to the Worthington line of products, is also being exhibited. *In Charge—J. S. Hazen.*



1500 FEET DRILLED

and its Cutting Edges are still Keen!



That's The Record of The First Kennametal 3-Way Bit. *Today these Modern Drill Heads Give Even Better Service, Because They Are . . .*

Now improved

by a properly shaped extension of the shank projecting between the prongs, to form an effective core breaker, and by modification of the cutting edge angles, that has resulted in distinctively extended service life.

The Kennametal-tipped 3-Way Drill Bit shown above was the first of its type ever used by a surface mine. After drilling thirty 50-foot holes in typical overburden, its edges were still keen. Thus, the tool material that had previously revolutionized metal-cutting, demonstrated that it was ready to do an outstanding job for America's mining industry.

Today, Kennametal 3-Way Drill Bits are at work at scores of leading surface mines. Typical field experiences are as follows:

—Ohio mine reports: "Have used a Kennametal Bit continuously for one month and it is still cutting faster than any other type bit we ever used."

—Indiana mine says: "First Kennametal Bit used drilled holes needed in removing one-half million cubic yards of overburden, before being resharpened."

—Pennsylvania mine reports: "Kennametal Bit put down 15 holes, 60 feet deep, in 390 minutes, in overburden consisting of hard shale imbedded with limestone nodules. Did not need resharpening."

The Kennametal Drill Bit is a sturdy, one-piece heat-treated alloy steel casting, having cutting tips of Kennametal—the tool material that is much harder than the hardest tool steel (75 Rockwell C compared to 66). It is scientifically contoured to maintain gage throughout its long life. The shank is welded-in bar steel, adaptable to fit all common types of augers. *It is the first and only bit that drills holes without taper—and drills more of them faster, cheaper.* Ask us to show you the evidence.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.

JOY

LOADERS · SHUTTLE CARS
MATERIAL TRUCKS
CUTTING MACHINE TRUCKS

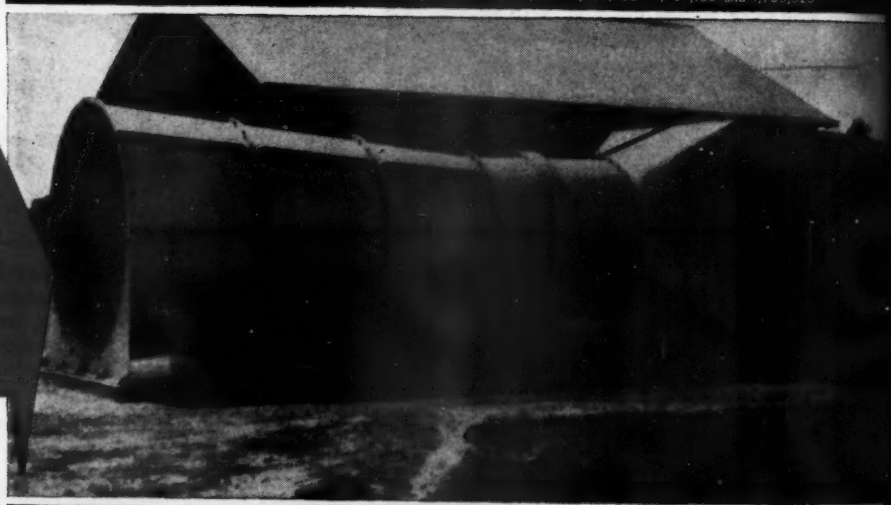
SULLIVAN

CUTTING MACHINES · COAL DRILLS
AIR COMPRESSORS · ROCK DRILLS
LOADERS · HAULERS · HOISTS

Licensed under the patents to E. C. Morgan Nos. 1,706,961 1,706,962 1,707,132 and 1,953,325

LA-DEL

AXIAL FLOW FANS
Mine Ventilation Type
UNDERGROUND BLOWERS



LA-DEL

CONVEYORS
SHAKER-CHAIN
BELT

JOY SULLIVAN LA-DEL

combined to offer lowered costs and increased output through modern mechanized mining methods

Consult a Joy Engineer

JOY

MANUFACTURING COMPANY

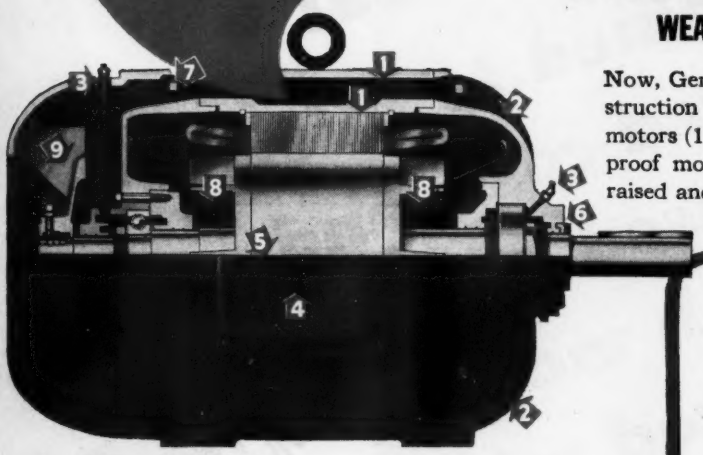
GENERAL OFFICES: HENRY W. OLIVER BLDG., PITTSBURGH, PA.

"The Worlds Most Complete Line of Coal Mining Machinery"

A DOUBLE WALL *Keeps trouble out*

NEW *TRI/CLAD* TOTALLY ENCLOSED MOTOR IS MORE FULLY PROTECTED FROM DUST, DIRT, WEATHER, OR WHAT-HAVE-YOU . . .

Now, General Electric has applied Tri-Clad construction to its line of totally enclosed induction motors (1 to 1000 hp) and to most of its explosion-proof motors as well. ***Extra protection*** has been raised another notch.



FOR EXTRA-SEVERE JOBS

Applications amid dust, metal filings, coolants, or corrosive agents, where totally enclosed motors have always been required, will now have the benefit of a stronger armor, plus convenience features that simplify installation and servicing.

FOR EXTRA-WET LOCATIONS

Indoors or out, these Tri-Clad totally enclosed motors will take hosings or heavy rains without danger of shutdown. The cast-iron frame is strongly resistant to rust and corrosion.

FOR EXTRA LONG LIFE

Many motor users are making the totally enclosed motor their standard for *all* jobs—based on evidence of long-term savings. This new member of the Tri-Clad line makes this decision more logical than ever.

HAZARDOUS ATMOSPHERES

"Companion motors" to the standard Tri-Clad totally enclosed, the new explosion-proof and dust-explosion-proof types are tested and listed by Underwriters' Laboratories for Class I Groups C and D, and Class II Group E, F, and G.

THESE 9 POINTS

of new strength and serviceability put this Tri-Clad totally enclosed motor way ahead

1. A cast-iron, double-wall frame that completely encloses windings and punchings
2. Ribbed cast-iron end shields, machined to provide a tight seal, yet easily removed
3. Well proved pressure-relief greasing systems which can be packed with a long-life lubricant where advisable
4. Cast-iron conduit box diagonally split for wiring convenience (independently explosion-proof on explosion-proof motors)
5. Leads are sealed in a nonshrinking compound at the point where they emerge from frame
6. Rotating, labyrinth seal prevents infiltration of grit or liquids
7. Large, free-flowing, easy-to-clean air passages protect parts from accumulation of dust and foreign matter
8. Modern "ageless" insulation treatment includes Formex* magnet wire
9. Powerful external fan is removable, simplifying maintenance. (Nonsparking type for explosion-proof motors.)

AND IN ADDITION—compactness and short length promote ease of handling and installation.

*Trade-mark Reg. U.S. Pat. Off.

GENERAL ELECTRIC

250-257C-8048

FOR THE COMPLETE STORY

GENERAL ELECTRIC COMPANY
Apparatus Dept., Schenectady 5, N. Y.

Please send me GEA-4400, which describes the new Tri-Clad totally enclosed motor.

Please send me GEA-4131, "Motors and Control for Hazardous Locations."

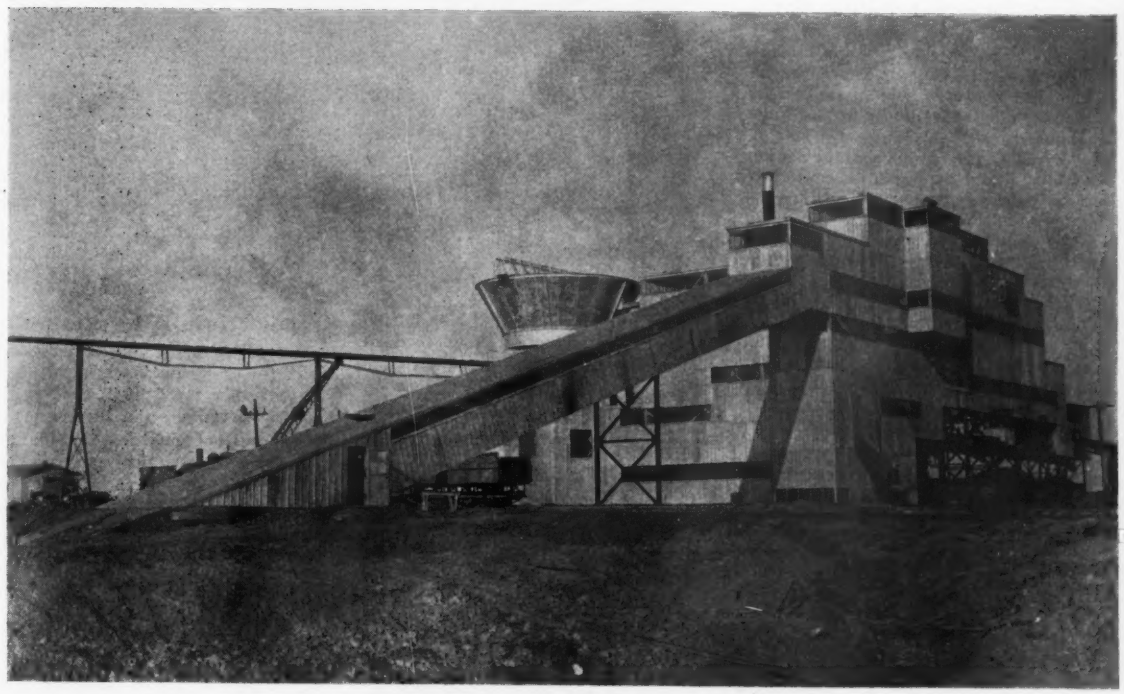
Name.....

Company.....

Address.....

3888

Electric Equipment for Modern Coal Preparation Plants



Efficient is the Key to Successful Operation of Coal Cleaning Equipment and This Article Explains the Principles of Correct Application and Control of Electrical Systems

★

By J. T. BAILEY
Mining Division
Industrial Engineering Divisions
General Electric Company

★

APPROXIMATELY 275 tons of bituminous coal are cleaned and prepared for market every minute of the day in preparation plants of the United States. At the same time, 1,100 tons of bituminous coal, both cleaned and uncleaned, are made available to the market. In other words, 25 per cent of the bituminous coal mined today is cleaned in preparation plants.

There are approximately 15,000 bituminous coal mines in the United States. Ninety-two per cent of the coal comes from 1,810 mines and 47 per cent of the coal from 318 mines.

In 1943 coal from these 15,000 mines supplied 50.7 per cent of the nation's total Btu equivalent. Petroleum supplied 26.7 per cent, water power 11.9 per cent and natural gas 10.7 per cent of the total Btu equivalent.

Paper presented June 13, 1946 at Beckley, W. Va., to joint meeting of American Institute of Electrical Engineers (West Virginia section) and New River and Winding Gulf Electrical and Mechanical Institute.

Competitive Position of Bituminous Coal

One of the major factors which will influence the competitive position of bituminous coal is the preparation of a better end product—one having a higher Btu content per ton. High ash coke reduces steel production 5 per cent for each 1 per cent increase in ash content over 9 per cent and requires more coke per ton of steel. Coke produced from 6.5 per cent ash coal will contain from 8.8 per cent to 9.2 per cent ash. The sulphur content of coke equals 0.8 per cent of the sulphur content in coal and it has been determined that coal with a sulphur content up to 1.3 per cent can be successfully used for coking. Furthermore, the reduction of ash by cleaning improves the calorific or heat value, thus increasing the boiler or heating efficiency of steam and domestic users and also decreasing the weight with an inherent saving in freight charges.

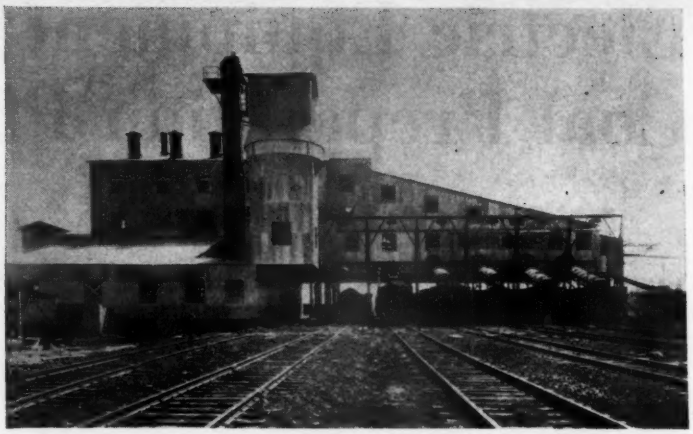
Effect of Mechanical Mining

In addition to the more stringent requirements on the part of the markets, fundamental changes have taken place in the actual mining of the coal. Since the introduction of the cutting machine in 1873, 11,700 of these machines have been put in use. Ninety-one per cent of all the coal mined is

undercut by mechanical cutters. The advent of the mechanical loader in 1923 eliminated the selective hand mining as formerly practiced and at the present time there are approximately 8,000 loading machines in use.

These machines load approximately 51 per cent of the coal that is mined.

Mechanical loading inherently increases the ash and sulphur content of the coal due to the loading of the top and bottom sections of the coal bed which are normally high in sulphur. The inclusion of slate, horse backs and fire clay which appear in the seam also contributes to the lowered quality of the product. Formerly, the experienced miner could hand load clean, low ash and low sulphur coals by means of selective mining at the face.



A coal cleaning plant in Illinois

Increase in Use of Preparation Equipment

The foregoing factors have contributed to the growth of coal preparation plants. The first bituminous coal was mechanically cleaned in 1906. Table I shows the history of preparation of bituminous coal, from that year through 1945.

TABLE I

GROWTH OF BITUMINOUS COAL PREPARATION.

Year	No. Tons Cleaned	Per Cent of Total Mined
1906.....	9,000,000	2.7
1920.....	18,200,000	3.3
1930.....	38,000,000	8.3
1940.....	98,000,000	22.2
1945.....	145,600,000	25.0

Note that in 10 years, from 1930 to 1940, a jump from 8.3 per cent to 22.2 per cent took place. This period marked the introduction of the modern efficient coal preparation plants.

Table II gives preparation data on the three leading coal mining states.

TABLE II

PREPARATION BY STATES, 1945 (THREE LEADERS)

State	No. Plants	Tons Cleaned
West Virginia	124	31,600,000
Pennsylvania	67	35,400,000
Illinois	53	30,300,000
U. S. A.....	432	145,600,000

A general idea of the external appearance of modern coal preparation plants is given in the accompanying illustrations.

Selection of Equipment

The selection of mechanical equipment for a preparation plant is dependent upon the type of coal that the market demands, the characteristics of the coal being mined and the management's interpretation of the most suitable type of machinery. Equipment which may be used in such a plant is listed as follows:

- Run of mine conveyor
- Raw coal pre-classifying screens
- Crushers
- Automatic impulse washers—Baum type
- Vacuum jigs
- Wet jigs
- Launders of Rheo type
- Heavy media systems (Chance and American Cyanamid)
- Washed coal classifying screens

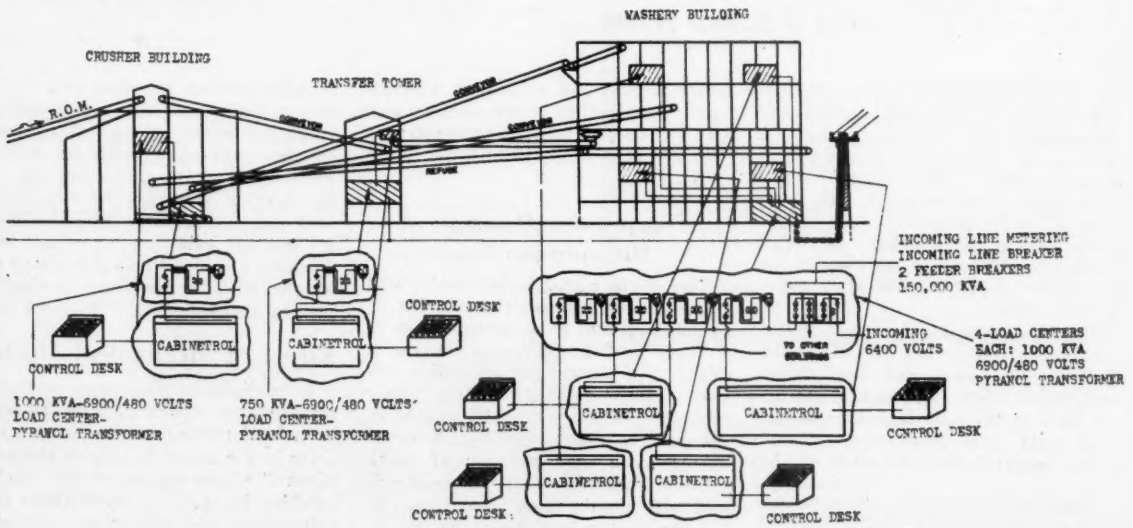


Fig. 1. Schematic layout of electrical equipment in a modern coal cleaning plant

Fig. 2. Typical outdoor master substation

Dewatering screens
Thermal driers
Centrifugal driers
Pneumatic air tables
Dust collection systems
Blending conveyors and loading booms

All of the machinery in a plant of this type is electrically driven. Figure No. 1 depicts typical mechanical and electrical layouts. Table III gives information on installed motor capacity for typical plants.

TABLE III

MOTOR DATA FOR SOME TYPICAL MODERN PREPARATION PLANTS

Tons Per Hour	Total Hp. Connected	No. of Motors
2,000	6,250	245
800	2,530	150
600	1,775	78
600	1,235	69
500	740	35
400	840	39
400	720	39
350	395	37

A "rule-of-thumb" figure may be derived from Table III, which can be used in estimating motor capacity required for a proposed preparation plant. It can be readily seen that for plants rated above 800 tons per hour approximately 3 hp. in motor capacity is required for each "ton per hour." The number of motors varies with the processes involved, but the total connected horsepower is fairly constant regardless of the process.

Electric Distribution and Control Equipment

Figure No. 1 includes reference to a variety of types of electric equipment. The first consideration in the selection of electric equipment for such a plant is the incoming power supply. It is customary to supply a master unit substation, Figure No. 2, which receives the incoming high voltage power company line at an outdoor substation including horn gap switches, fuse disconnects and an oil-filled power transformer. This transformer may be unit connected to feeder breakers which handle the secondary circuits rated 2,400, 4,160 or even 7,200 volts.

Power from this master unit substation may then be transmitted through underground cables in the plant; or metal clad switchgear feeder breakers, to unit substations, which will be located at load centers throughout the plant. The unit substation normally consists of an incoming line breaker unit-connected with an askarel or dry-type transformer which steps the voltage down to 480 volts. Unit connected on the secondary of this transformer may be 480-volt feeder circuit breakers or a control center consisting of grouped individual full voltage starters for the driving motors in that locality.

This unit substation will supply power through feeders to lighting transformers and distribution panels, capacitor banks for power factor correction (the power factor of the preparation plant will usually be in the neighborhood of 0.8 lagging due to the use of induction motors) and in many cases the feeders supply power to remotely located unit control centers.

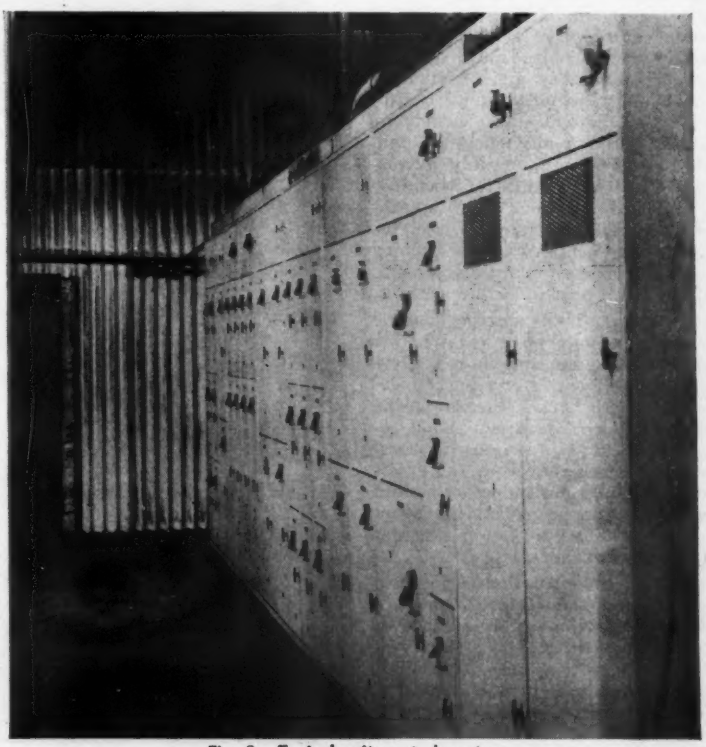


Fig. 3. Typical unit control center

Figure No. 3 shows a typical control center. This convenient scheme provides a complete coordinated control equipment including all sequence wiring, interlocking and protection for the individual motors. Such a scheme relieves the purchaser of the expensive and difficult wiring required with individual starters as shown in Figure No. 4. Such a control set-up has been known to require 150,000 feet of control wiring in the field, whereas with the unit control scheme a large portion of this field wiring is unnecessary. The operation of the starters in the control center and, in turn, the motors, is controlled from master push button consoles or panels located at strategic points throughout the plant.

Some operators are partial to the panel type station since there is less likelihood of coal dust accumulating on the vertical surfaces and thus masking the designating nameplates.

Motors

The producing part of the electric equipment is naturally the driving motors. Several types of motors are found in the various preparation plants, namely, normal starting torque squirrel cage induction motors, high starting torque squirrel case induction motors, and wound rotor induction motors and in several constructions such as open 40-deg. C rise motors, splash-proof 50-deg. C rise motors and totally enclosed, fan-cooled 55-deg. C rise motors. The selection of the type of enclosure is dependent upon local conditions and customer's or machinery manufacturers' preference. Some plants are completely equipped with totally enclosed, fan-cooled motors, but generally a combination of open motors for machines in protected locations and splash-proof or totally enclosed motors for dirty or wet locations is satisfactory since most modern plants are being equipped with dust-collection systems.

In general, high starting torque squirrel cage motors are required for shaker screens, pan and flight conveyors, large belt conveyors, bucket elevators and crushers. Normal torque squirrel cage motors are used on reciprocating plate feeders, washers, driers, small belt conveyors and auxiliaries. Wound rotor induction motors may be used on large belt conveyors requiring 200-hp. or 300-hp. motors and on large crushers.

It should be noted that adjustable speed drives of the electronic type are sometimes used on blending feeders; and direct-current motors of the open or enclosed type may also be used on drives which must operate at adjustable speeds. Figure No. 5 shows a totally enclosed, fan-cooled motor

(*Continued on page* 67)

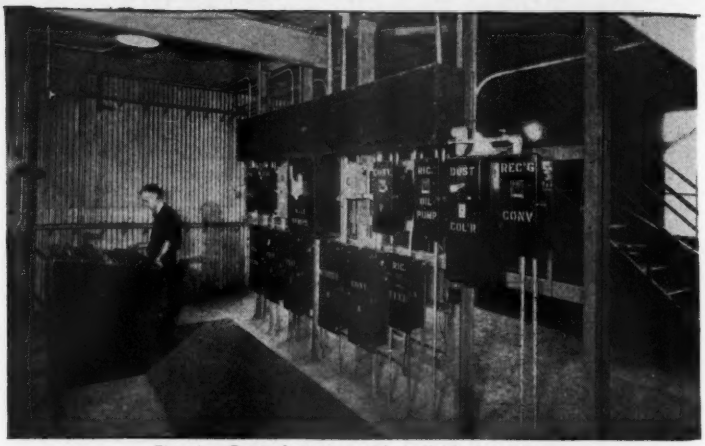


Fig. 4. Control station with individual starters

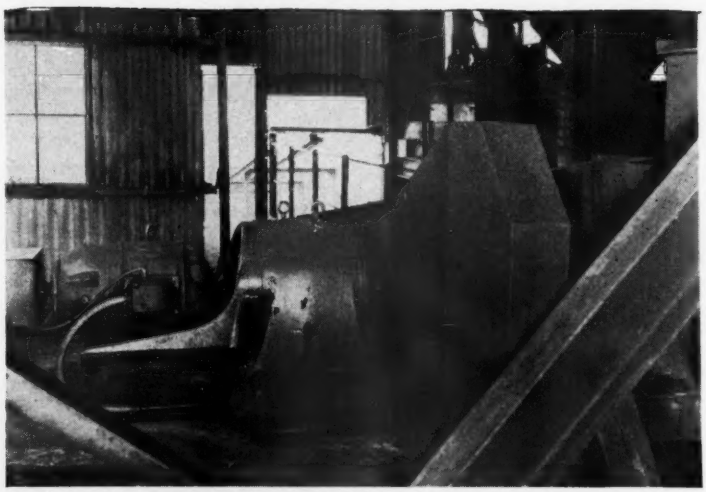
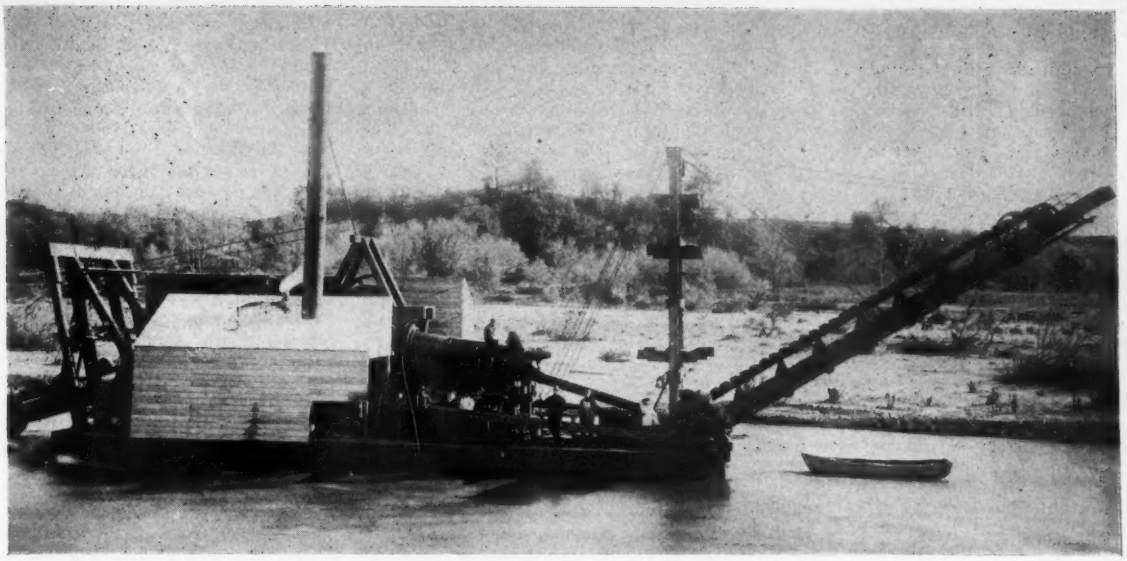


Fig. 5. Enclosed motor driving R.O.M. conveyor

Fig. 6. Enclosed motor driving vibrating screen



This dredge made history. The first modern dredge in California, built by W. P. Hammon, at Oroville, in 1898

Gold Dredging In California

An Operator Points Out That Dredging in California Has Played an Important Part in Flood Control and Has Increased the Value of Marginal Farm Lands in Many Areas

By H. A. SAWIN
Yuba Consolidated Goldfields
San Francisco, Calif.

SEVERAL weeks ago we were privileged to hear one of our members make a hypothetical plea for a mythical California rancher, one who had made a great success of ranching in the old days when help was plentiful and easy to get or get rid of, as ranch needs dictated, and also one of the fortunate few favored by nature in that a gold mine was discovered on his ranch. He was faced with the big question: Shall I ranch or mine this ground? Dredging was just beginning in California, gaining importance rapidly, from a small start with the usual headaches of pioneering, but holding forth the lure of gold and success, if good fortune held. Streams flowing out of foothills and higher lode regions had carried, for thousands of years, placer gold washed and reconcentrated from ancient river systems which had flowed at right angles to present waterways.

Water moving has carrying capacity which increases with velocity. Nature, in at least three major earth movements, has tilted the High Sierra block to its present elevation, carrying upward the ancient stream gravels containing gold particles. New rivers, such as the Feather, Yuba, American and Merced, cut at right angles to the old and flowed westward into the great Central Valley. These new streams picked up gravel, sand and gold, bringing them down to the alluvial deltas common to many Sierra rivers and the reconcentrated gold was redeposited in benches, bars and stream beds, many of which are quite removed from present river bottoms.

Lucky farmers or ranchers located on valley lands containing these gold deposits often found that their soil was poor pay at best, and following the natural course of human nature, many were willing and glad to turn their ranches into gold mines. With the advent of modern dredging methods, profit was sure and fast compared with ranching. Lands without gold-bearing gravels are by far the greater proportion of California lands classed as ranch lands, crop lands, woodlands, or whatever you want to call a particular piece of ranch property. This is a matter of official record. U. S. Census figures classify as agricultural lands in California some 30,500,000 acres. Dredges to date have mined about 50,000 acres located in many parts of the state from Oregon to Tehatchipi, most of which no agricultural value. Fifty thousand is only a tiny fraction of the state's so-called agricultural lands and this alone points to the almost ridiculous position of those who claim that dredging is ruining the farming of California.

Dredge Tailings a Source of Wealth in Many Cases

The economic gain in new indestructible wealth since dredging started in 1898, plus the vast number of jobs created thereby and the millions of dollars circulated in payment for wages, power, supplies, capital equipment, taxes, plus personal profits, are seldom mentioned by the "do-gooders" who see in dredging only a ruinous

A paper read before the Mining Committee of the Commonwealth Club of San Francisco.

procedure. They object to rock piles, but overlook the fact that rock piles sometimes change hands at higher prices per acre than the land from which they were dredged and stacked. Dredge tailings for many years have been a principal source of California's road and building materials. They fail to state that dredging operations in California have in a large measure made successful the flood-control projects undertaken by government agencies and U. S. Army engineers. In one area (Sacramento), the Natomas Company and its affiliates built levees which protect from flood waters about 60,000 acres of top-grade farm lands and made them inhabitable. That is more land than all dredging operations to date have mined. Other dredge operations on the Yuba and Feather have worked for 25 years or more in building channels and straightening streams to aid in flood control. At Hammonton, 12 miles east of Marysville, two channels, each 500 ft. wide and five miles long, carry water which at flood periods is still rising after the highest stage at Marysville is reached and water there is receding. These channels were built by Yuba Consolidated Gold Fields, cooperating with the U. S. Army engineers, during gold-dredging operations and in correcting earlier flood-control efforts which were unsatisfactory. Marysville and all points downstream are far safer today because of dredging than ever before in times of high water. The same is true of Oroville, where flood-control work is presently being done by gold dredges in the course of their work, and in valley towns below it on the Feather. The only dredge operating on the Feather during the war was a large drag line outfit owned by Golden Feather Dredging Company. It was permitted to continue work, despite WPB Order 208, because it was building a levee to protect Oroville itself against floods. Other dredges downstream have for years worked with government agencies in straightening and controlling the Feather.

Resoiling Impossible Where Soil Never Existed

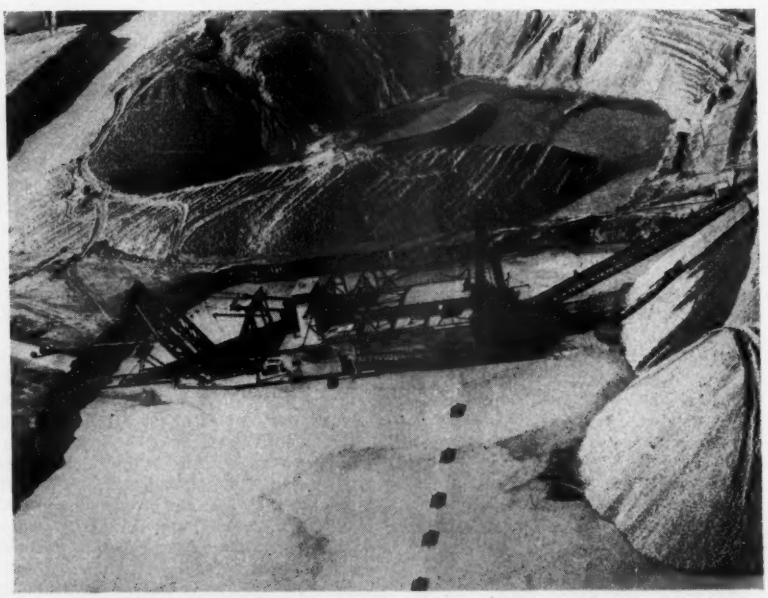
Space does not permit a detailed account of dredging methods or history. Periodically the industry is attacked by opinionated editors, publicity-seekers or politicians who write and talk glibly about resoiling of dredged lands and who seek to force dredge operators to do the impossible; namely, to put top soil on land when no soil exists or where it is physically impossible to restore a limited amount of top soil after dredging to great depths. These attacks make some headway at times and since 1913 have popped up frequently in the legislature in the form of bills aimed at regulating the industry in one way or another. The California State Grange has the farmers' interest at heart—and rightly so—but why should a farmer with a gold mine continue farming if he doesn't want to? The names of the Grange and other groups have appeared in connection with bills presented in the legislature aimed at compulsory resoiling. One fact regularly overlooked by resoiling proponents is that there is, in California, a reserve of untilled farm lands, equivalent almost to the area of farm lands actually plowed and planted.

A man with a mine on his property, suitable for dredging, can lease the ground and with his royalty payments buy better farm land elsewhere, if he wants to farm, and still have a substantial cash capital. Land in Butte County near the Feather, and covered with several feet of slickens and sand, washed down by recent floods, is held at $50 per acre, but if leased for dredging, it returns to the owner $700 per acre approximately. Levees are being constructed now by gold dredges which protect the Gridley area, and are being extended under a plan approved by the Reclamation Board.

Many millions of dollars are invested in dredging equipment, lease holds and property for dredging. To pass laws or ordinances restricting existing dredge operations, by requiring the impossible, is thought by many to be unconstitutional. A Merced County ordinance, so set up and enforced, is being tested by a suit in the U. S. District Court in Fresno. At this writing, no decision has been handed down. Stanislaus County tried a similar ordinance, but its supervisors withdrew it in face of a suit involving large damage claims. Other counties have been more far-sighted. Local ordinances in Trinity and Siskiyou Counties, where gold mining has been the leading industry for years, are of a zoning type. There is no objection from dredge owners if such zoning ordinances are prepared in a manner which give two-way protection. Existing commitments are not disturbed and the County Zoning Commissions can assist in planning future dredging to suit the best interests of all, including neighbors of a farmer whose land is valuable for dredging because of nature's whim in building a gold mine for him.

Resoiling Not Clearly Analyzed by the Public

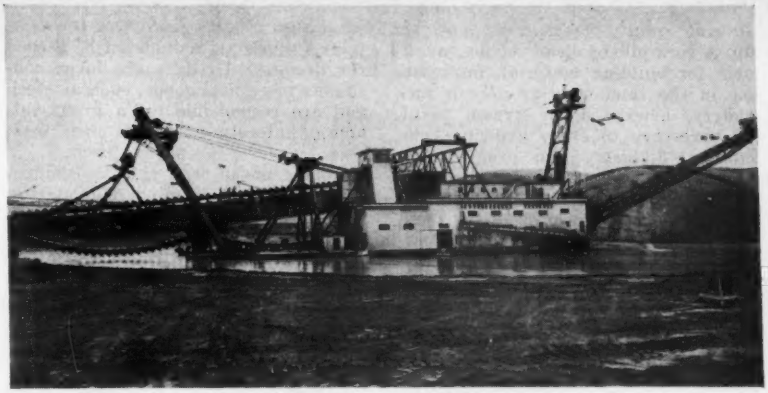
Time does not permit more than a mention of resoiling. A favorite theme of the uninformed is "it only costs a cent a yard to resoil." Sometimes the cost given is "half a cent." Dredging costs are based on cubic yards of gravel handled, not square yards or acres. An acre of land, 30 feet deep (and that is a good average of California's usual dredging areas), contains 48,400 cubic yards of gravel. Sometimes dredging land has an overburden of 1 to 3 ft. of soil, seldom more and usually less, because gold-bearing gravel deposits are old river benches and bars where top soil is nonexistent or is made up of only a few inches of wild grass roots and trash. Forty-eight thousand, four hundred cubic yards of gravel at 1 cent equals $484. Perhaps the land was worth from $50 to $250 an acre



Yuba No. 20, at Hammonton, works at depths of 126 feet against a 50-ft. spoil bank

or even more originally. Is any rancher or other person in his right mind going to spend $484 per acre to attempt resoiling land which won't be worth one-tenth that amount when he is finished? For lots less he can buy real farm land or orchards elsewhere.

Aside from the "cost of resoiling" angle, there is another point which goes wholly unrecognized by resoiling proponents. In the early part of this paper I mentioned the manner in which gold-bearing gravel beds were laid down by moving water. Water has a carrying capacity which increases with velocity. A method of resoiling often suggested is to place fine material on top of loose, large cobbles or rock, pumping some of the fines with muddy water to the top of the tailings. The same carrying capacity of water acts then in the same manner as in depositing gold. It carries fine material down into the spaces between the rocks and also washes fines back into the dredge pond. One company (Natomas) spent well over a million dollars and eight years in trying to accomplish just what "resoilers" today suggest. Remember that rock and gravel comprises about half of the total material dredged and is distributed throughout the deposit; there is little if any top soil. Such methods cannot be used successfully under most California land conditions, despite the fact that resoiling is reported to have been done in this manner in Australia and Korea. The Korean

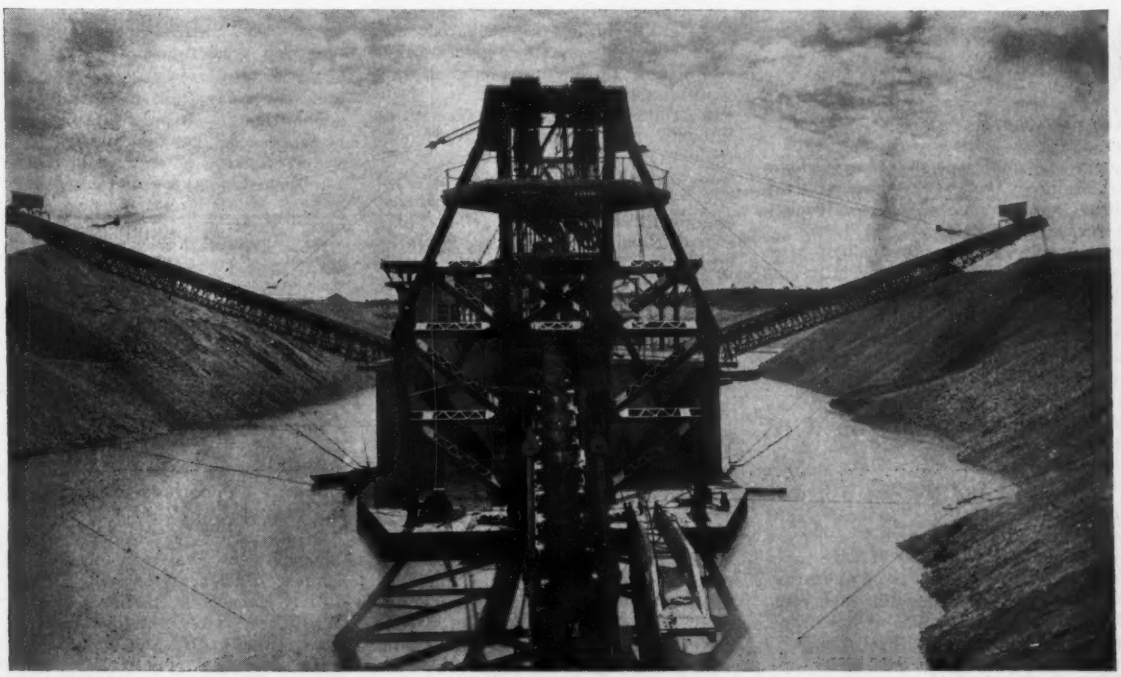


Yuba 20 weighs 3,750 tons

dredge fields consist mostly of fines and rock tailings are not a problem. Coolie labor is cheap and hundreds of men with muck-sticks and shovels can be employed profitably in reclaiming dredging areas for rice paddies. In Australia the ground resoiled has many feet of fertile overburden which is stripped by dry dredging and put aside to use in recovering the gravel. A similar method used in a few places in California is pointed to frequently as evidence that resoiling is possible. There, again, the top soil is 10 to 12 ft. deep and the gold-bearing gravel underlying it is only 2 or 3 ft. That is not a resoiling problem nor accomplishment. The top soil is removed by drag line methods and cast to one side. Then the gravel is dug and washed and put back in the ditch. Following that, the next strip of overburden is removed. It has to be put somewhere so it goes into the preceding ditch over the washed gravel. Nothing could be more simple, but it is not bucket line dredging and it is not resoiling such as most people have in mind. It is merely earth moving and during the operations drainage can be realigned; soil can be aerated and improved.

Operators Have Encouraged Constructive Ordinances

It is time to summarize a bit. Do dredge owners object to ordinances which zone counties for the purpose of preserving land to its best use? No! They have encouraged that kind of a law and have aided in preparing



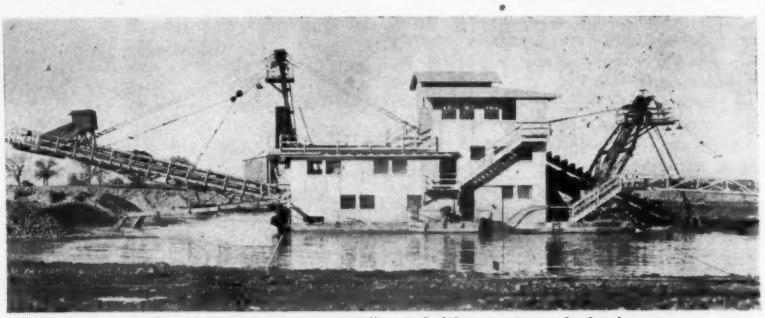
Here a dredge digs a channel for a U. S. Army Engineers' flood control project

several county ordinances now set up. A rock pile of clean cobbles, available for building material, impresses me in the same way as does a rock quarry, brickyard, or gravel plant, all necessary to every growing community. Industry and progress demands the use of products of the earth. Gold is one of the principal products and has been used for thousands of years. This is not an economic thesis, so I will pass up discussing gold, moneys and inflation. You know that story and have heard it from every angle. All I want to say is that gold has a longer history of desirability than any commodity except fruits and grains and their by-products—alcohol and bread. But fruits or grains can be raised in many suitable areas while gold only is where you find it.

Does dredging as an industry add to California's wealth? Most assuredly! Since 1898 the total value, at $35 per fine ounce, of gold dredged in California is, in round figures, $437,500,000.* This is based on U. S. Bureau of Mines reports for the total number of ounces produced. I am told that better than 50 per cent of the gross is paid out in wages. About 2,600 men are normally employed in the gold dredging industry of the state. Probably 10,000 or more work indirectly here in support of the industry, furnishing parts, power, etc. The state's largest steel foundry was promoted by a pioneer dredge operator so that he could have a local source for the large castings, weighing as much as 20 tons each, needed for dredges. Dredges are large consumers of capital goods, such as steel, and are responsible for a great volume of interstate trade in such products.

I have never been able to comprehend the state of mind of a person who, having no personal interest or investment in an enterprise, spends time, money and effort to restrict or hamper that enterprise. Dredging is and has been a mainstay of many communities for nearly half a century. Perhaps it is inherent with some people to criticize the efforts and results of enterprising individuals who promote new ideas and succeed. The same kind of thinking leads to a desire for a rule or a law or a bureaucratic directive, governing every action of every person, every minute of the day. They believe in laws such as create bootlegging, black markets and regulation which stifles production, but let an industry produce real gold, improve the streams, make new agricultural lands and support thousands of families, these same people will see no value in such activity.

Personally, I can't see eye to eye with those who make personal capital out of the resoiling discussions. They either don't understand or won't make the effort necessary to learn the truth. Mining men are men of courage and vision and good citizens as a rule. Any problem connected with dredging can be threshed out, but in finding the answers it is not necessary to stifle an industry and further upset our state and national economy.



This small dredge operating near Wallace, Calif., uses 3 cu. ft. buckets in very hard ground

* Includes dragline production, 1933-42.

Making Iron Ore Pay

(*Continued from page* 24)

up for most units, typical of which are the shovels which go into the shop for a general overhaul about every 18 months, the churn drills which go in every two years, and the diesel motors which are reconditioned after approximately 5,000 hours of operation. The maintenance of wire rope on the shovels is especially important since the shovels are the prime loading factors in the mines. A cable break during production could easily disrupt an entire day's schedule.

Frequent Tests Made on Wire Rope

Recognizing the importance of wire rope, Butler Brothers, several years ago, started running test reels of various types and makes of wire rope, keeping complete records of operation and working conditions for each reel. Of the two general types of wire rope tested—ordinary and preformed—it was found that preformed wire rope lasted an average of twice as long and was easier to handle and operate.

After deciding to use preformed type wire rope on all cable-controlled equipment, Butler engineers set up a maintenance schedule for the rope. Wire ropes are manufactured with an internal lubrication which prolongs their working life, but during operations this original lubrication needs to be renewed. Wire ropes on Butler equipment are lubricated at least once every 48 hours with a good quality lubricant applied with a stiff brush.

Other maintenance methods which extend the life of wire rope include turning the hoisting ropes end for end at regular intervals and cutting off 3 to 6 ft. from the ends of the rope at least three times during its expected life. This practice more evenly distributes the wear and strain. Sheave groove treads and bearings are checked regularly.

Standardizing on preformed wire rope has not only extended the working life of each reel of cable and prevented lost production hours caused by preventable rope breaks, but has also served well the interest of safety. Preformed wire rope has repeatedly proved itself a safer rope to handle, witness the significant fact that with preformed wire rope on all equipment, not a single accident has resulted on Butler operations from handling wire rope.

Butler Brothers do not anticipate a heavy production schedule this season, although 10 open-pit mines will be operated. During the past four years, working at war peak, the firm established this record:

	Crude Material Handled (tons)	Ore Shipped (tons)
1942	8,766,167	4,392,065
1943	7,328,883	3,296,552
1944	7,703,170	2,751,564
1945	8,234,609	3,268,715

Butler Brothers' mines near Cooley, Nashwauk and Hibbing are ordinarily operated during a 190-day season with an average employment of approximately 575 men.

Organization of the firm includes Cooley Butler, chairman of the board; Emmet Butler, president; Patrick Butler, Francis D. Butler and Hazen E. Butler, vice presidents; Pierce Butler, treasurer, and F. J. McArthur, secretary. The general superintendent of mines is E. S. Mollard of Cooley.

Vertical Turbine Pumps For Mine Use

Construction Features and Operating Characteristics Make This Type of Pump Valuable for Mine Dewatering

By FENMORE E. DUNN

Hydraulic Design Engineer
A. D. Cook, Inc.

THE centrifugal pump, like numerous inventions, had many pioneers so that it is difficult to credit any one man with its invention. It is not a new machine, the first crude model is said to have appeared in 1680, and Euler discussed its theory 192 years ago. The first practical centrifugal pump was built in this country in 1818 and was known as the Massachusetts pump. It had an impeller of four radial blades and, so far as the impeller itself was concerned, would operate equally well in either direction.

In spite of the early development of the centrifugal pump, its general adoption and rapid improvement has been quite recent; this is because it is a relatively high-speed machine and until the development of the steam turbine and electric motor, there was no prime mover well adapted to it. Even then, however, the centrifugal pump had its limitations, as it was necessary to locate the machine within suction distance of the water. This was not always practical, and the need for a special centrifugal pump to draw water from deep wells gave rise to the development of the vertical turbine pump.

The first vertical turbine pump was probably built in Russia about the turn of the century. The first such unit built in this country was installed in Milwaukee, Wis., in 1901, in a 15-in. diameter well and operated against a head of 225 feet. Apparently it saw better than 25 years of service. During the past 10 years, the vertical turbine pump has found increasing application in irrigation, mine dewatering, handling volatile liquids and many others. Thus it has grown from a deep-well pump to a machine of diversified uses.

Presented at joint meeting of the American Institute of Electrical Engineers (West Virginia Section) and New River and Winding Gulf Electrical and Mechanical Institute, Beckley, W. Va., June 13, 1946.

Turbine Pumps are Not Complex

A vertical turbine pump is designed so that it can be lowered into relatively small diameter bore holes or wells and operated with a prime mover at the surface. The complete machine consists of three elements: the pump, the setting and the head.

The pump consists essentially of one or more impellers, equipped with blades, mounted on a rotating shaft and enclosed in elements called bowls. The fluid enters the impeller axially at the center and has energy, both kinetic and potential, imparted to it by the blades. The fluid leaves the impeller at a relatively high velocity and is discharged into the bowl. The function of the bowl is to convert the kinetic energy to pressure with an accompanying decrease in velocity and also to guide the fluid to the entrance of the next impeller. After the conversion of energy is complete the fluid is discharged from the machine.

The setting consists of a column pipe, which serves as an eduction pipe for the fluid and also as a means of suspension of the pump. Within the column pipe there is a line shaft which connects the pump shaft with the prime mover located at the surface, and is supported by bearings spaced throughout its length. The line shaft may be enclosed in a tube and lubricated with oil or it may be open and lubricated with the fluid being pumped. The length of setting may be as little as a few inches, or as much as several hundred feet.

The head consists of a discharge base from which is suspended the column and pump and upon which is mounted the prime mover, which is generally direct connected to the line shaft. The discharge base also contains an elbow which discharges the fluid into the desired piping system.

Limitations of the Pump Must Be Considered

The first limitation placed upon a vertical turbine pump is size. Due to the fact that they must be installed in relatively small-bore holes or wells, it is necessary to keep the diameter of the pumping elements as small as possible, and this limitation leads to small-diameter impellers. The amount of pressure or head developed by an impeller operating at a given speed is a function of its diameter; therefore, since the diameter is limited, it is generally necessary to place impellers in series, known as staging, in order to develop the necessary head. The result of staging does not change the quantity of flow, but does increase the pressure developed, directly with the number of stages added. In other words, a 10-stage pump will discharge fluid at the same rate as a one-stage pump, but will do so against 10 times as great a head.

Operating Characteristics

A centrifugal pump is rated at the capacity at which its efficiency is a maximum, and the head developed at the point of rating will be considerably less than the maximum head. There are several factors which limit the range of capacity through which a particular pump can be used, and the most obvious of these limiting factors is that of efficiency. As pointed out before, the point of rating of the pump is the rate of flow at which the efficiency is a maximum. To either increase or to decrease the flow from this point would be accomplished only at a sacrifice of efficiency, but good design will provide an efficiency characteristic with as broad a range as is possible. For an application where the head is not constant it follows that the rate of discharge will also not be constant; for such an application the pump should be so designed that the point of rating will be within the range of operation.

The second limitation can be explained in terms of the head characteristic curve. It is important that the pump be so designed that the head developed at the point of opera-

Three vertical turbine pumps drain an area of 8,000 acres at the New River Company, Mt. Hope, W. Va.

tion be considerably less than the maximum head developed by the pump. For example, suppose that in a particular installation, the maximum head which the pump will develop exceeds the operating conditions by only 5 ft. If the water level were to drop or some other factor were to be introduced which would increase the head by 6 ft., the pump would no longer deliver any water. On the other hand, if the pump were designed to the other extreme with excess head protection, additional stages would be required and hence a larger investment than is necessary.

Cavitation Can Have Serious Results

The third factor is the phenomenon of cavitation and must be avoided at all times in design and application. If the pressure at any point in a pump drops below the vapor pressure of the liquid, the liquid will vaporize. In so doing, vapor bubbles will be formed and will be carried along the stream of flow. When these bubbles reach a region of higher pressure, they collapse or implode, causing mechanical destruction in a form similar to erosion. The destruction does not appear at the region of lowest pressure, but appears on the blades and sidewalls at the point of higher pressure where the implosion occurs.

The reduction in pressure leading to cavitation in a turbine pump is caused by an increase in velocity which occurs as the rate of flow is increased. When the velocity increases, then the absolute pressure on the liquid is reduced, and if the velocity is increased sufficiently so that the absolute pressure is reduced below the vapor pressure, then cavitation will occur. Since water at 70 degrees Fahrenheit increases its volume 54,000 times on vaporizing, it follows that cavitation is accompanied by a reduction in capacity. The tremendous impact from the collapse of the vapor bubbles is accompanied by a noise and by vibration. The vibration generally has a further destructive effect causing the rapid deterioration of the line shaft and line shaft bearings.

Impeller Action Not Always Understood

There is another design factor, often misunderstood or overlooked, that can introduce vibration. To consider this factor it is first necessary to develop the concept of hydraulic thrust. A vertical turbine pump impeller is subject to axial thrust which is the result of two opposing forces. The fluid discharged from the impeller is at a higher pressure than the fluid on the suction side, and this unbalance in forces results in a thrust load which tends to move the impeller toward the suction side. This load is carried on a thrust bearing located at the surface and in most cases the bearing is in the prime mover itself; for example, in the case of a motor drive, the motor thrust bearing is designed to carry this additional load.

The thrust, however, is not constant throughout the operating range of the pump. Since the thrust load is a function of the difference in pressures existing on opposite sides of the impellers, it follows that the

load must be a maximum at the point where the developed head is a maximum and that it decreases with the developed head. It was determined earlier that the head decreases as the flow increases.

The second force which contributes to hydraulic thrust is due to the change of momentum of the fluid entering the impeller. The fluid approaching the entrance of the impeller axially has a velocity. Its change of momentum or force is equal to its mass times this velocity. This force acts in the opposite direction to the force due to pressure difference and tends to lift the impellers away from the suction side. This force is usually considered to be negligible, but it is important enough to warrant further examination.

As we increase the flow of fluid from the impeller, we also increase the velocity of the fluid entering the impeller. As we increase the velocity of the fluid entering the impeller, the force due to change of momentum is also increased. Therefore, we have two forces acting axially on the impeller. The force acting downward is normally the larger of the two forces, but is decreasing as the rate of fluid flow is increased. The normally smaller of the two forces is acting upward and is increasing as the rate of flow increases. The net axial force acting on the impeller is the difference between these two forces acting in opposite directions. It is conceivable that the rate of flow can be increased to a point where these two forces balance and the net axial thrust on the impeller is zero. Actually, this point can be located in testing the pump, and when it is reached, the impeller responds as though it were floating inside the bowl. Further increase in flow will result in the net axial thrust being upward rather than downward. This reversal in the direction of thrust can and does cause vibration in the line shaft.

An Explanation of the Vibration Problem

Just how this vibration comes about can best be described by an illustration. Suppose that we were to suspend vertically, a wire of approximately 1/16 in. diameter and 10 feet long. Spaced every 4 in. along the length of this wire would be a guide ring about 1/8 in. wide. Now if we were to rotate this wire at 1,800 R.P.M., we would expect it to chatter and vibrate extensively. We would further expect that between the guide rings the wire would have a tendency to bow or create wave motions. In other words, we would expect anything but smooth vibration-free rotation. Let us further suppose that while the wire is running, we can in some manner exert a tensile pull on the bottom end of the wire. We increase this pull until we have drawn the wire tight and literally pulled the wave motion and vibration out of the system. The wire will then be running smoothly and will continue to do so as long as we exert this tensile load.

The length to diameter ratio of the wire in the preceding illustration is equivalent to 300 ft. of 2-in. diameter shaft. The pull which we exerted on the wire is analogous to the hydraulic thrust exerted on the impellers. If we design or apply the pump so that its point of operation is at or near the point of thrust balance, then we can expect the line shaft to react in the same manner that the wire reacted in our example. It is important to realize that the point at which this type of vibration starts is very often reached before the cavitation point is reached. For this reason, if a vertical turbine pump is used for the maximum capacity obtainable without cavitation, vibration due to insufficient hydraulic thrust may be introduced into the system.

From this discussion it is obvious that the hydraulic thrust load forces us to the use of a thrust bearing and an oiling system to cool the thrust bearing. On the other hand, far from being a detriment, the hydraulic thrust load is the prime factor that enables us to run several hundred feet of line shaft with so little vibration that you can balance a nickel on the head of the completed unit. This, in spite of the fact that the entire setting and pump is unsupported throughout its length, but is merely suspended from the surface.

Electrical Equipment in Coal Preparation

(*Continued from page* 60)

driving a belt conveyor. Figure No. 6 shows a totally enclosed, fan-cooled motor driving a vibrator screen. Figure No. 7 shows an adjustable speed motor, controlled by a Thy-mo-trol drive, operating a blending feeder.

Manufacturers of Equipment

Among the more prominent preparation plant designers and manufacturers are McNally Pittsburgh Manufacturing Corporation, Roberts and Schaefer Company, Jeffrey Manufacturing Company, Link-Belt Company, Fairmont Machinery Company, and Kanawha Manufacturing Company. The major electrical manufacturers have worked very closely with these machinery manufacturers in designing complete coordinated electric equipments for the most efficient operation of the plants. Considerable "know how" is required in arranging this electric equipment and the electrical manufacturers stand ready to relieve the ultimate user and operator of the many details of design, sequencing and ultimate operation. The ultimate user naturally plays an important part in the design of such a plant since he must establish, in cooperation with the machinery manufacturer, the fundamental processes that will be used. The resources and ability of the machinery and electrical manufacturers are available and should be utilized for the detail work involved in designing a modern coal preparation plant.

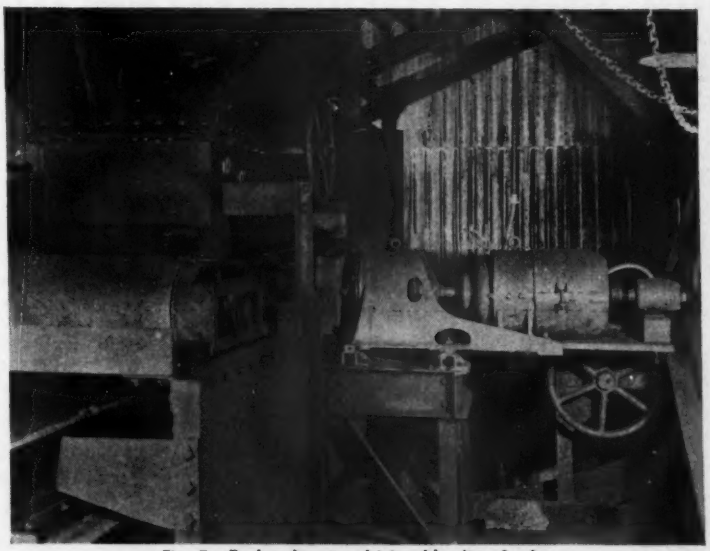
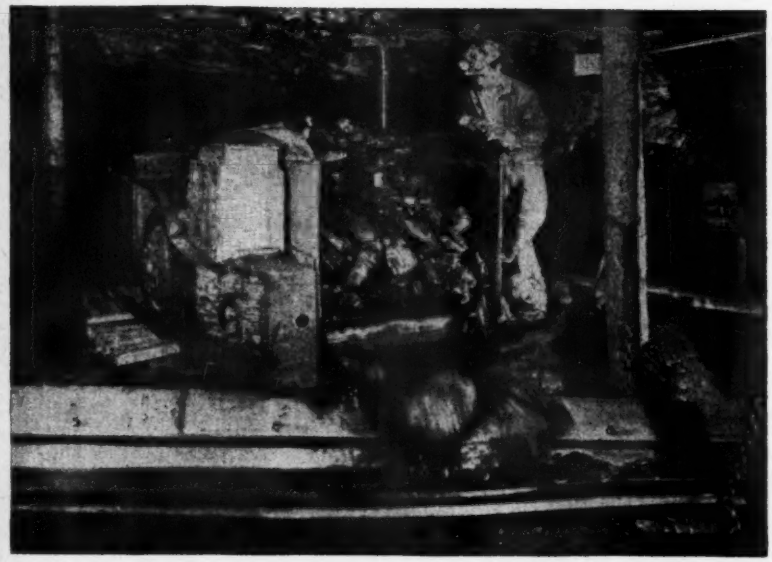


Fig. 7. Enclosed motor driving blending feeder

BATTERY-POWERED Shuttle Cars Give Most Flexible Operation



. . . ALKALINE BATTERIES give most trouble-free power

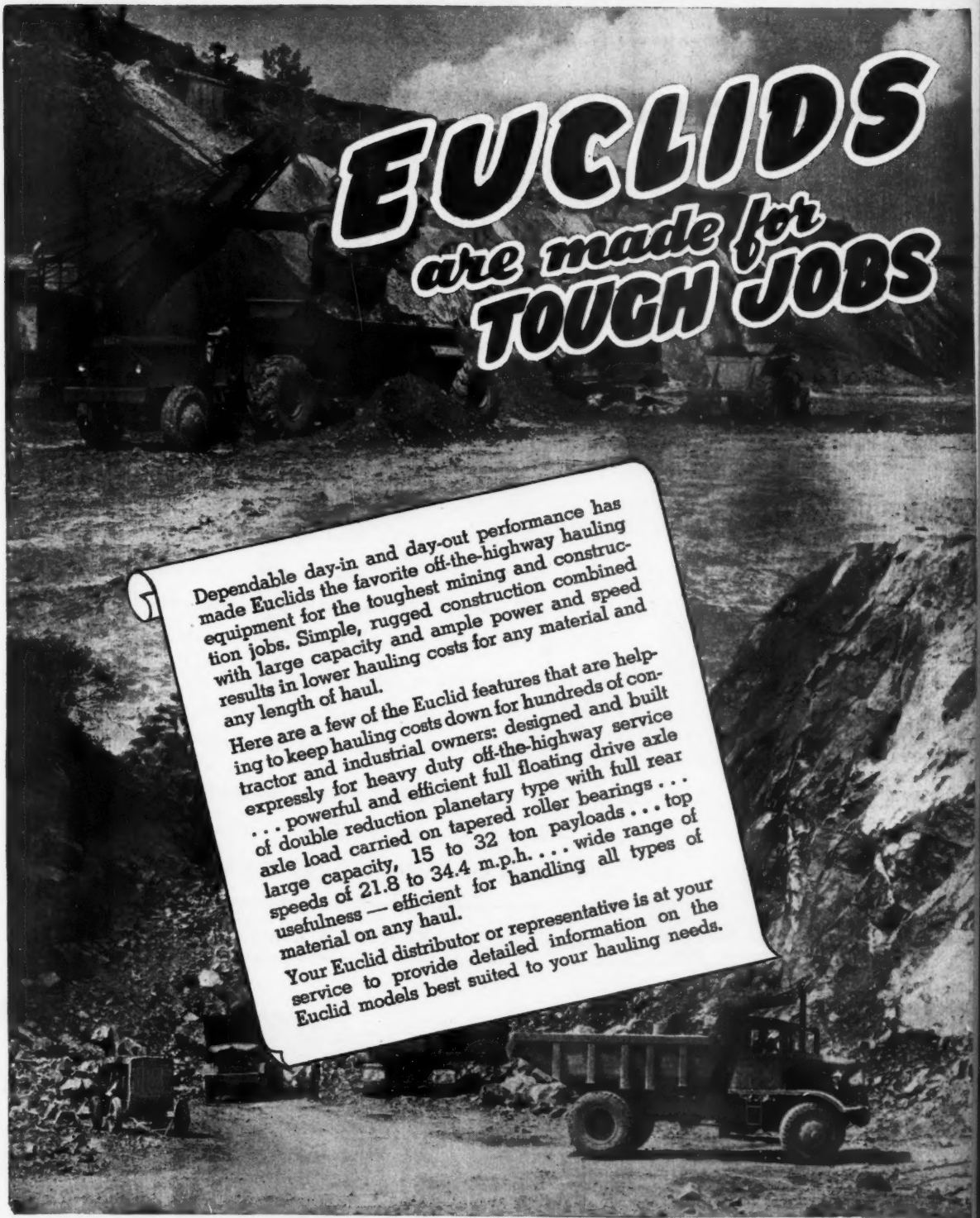
Because they carry their own power supply, battery-operated shuttle cars have high operating flexibility. They require no external power connections to jeopardize safety, require maintenance, or delay production while being connected or disconnected and during the roundabout maneuvering often necessary to avoid running over them. Because they have a minimum of moving parts, they are easiest to keep in working order.

With batteries exchanged between shifts, a shuttle car is kept continuously supplied with power. While one battery operates the car, the other is charged. Not only does the car make efficient use of power but the current for battery charging is low-cost power because charging can usually be done during off-peak hours. In that case, a substantial reduction in maximum power demand is also effected.

Altogether, the superior flexibility, higher availability, and overall operating and maintenance economy of the battery-powered shuttle car make it an inherently dependable and efficient haulage unit—especially when powered by Edison Alkaline Batteries. With steel cell construction, an alkaline electrolyte that is a preservative of steel, and a fool-proof electrochemical principle of operation, they are the most durable, the longest-lived and most trouble-free of all mine-haulage batteries. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. In Canada: International Equipment Co., Ltd., Montreal and Toronto.

Edison

ALKALINE BATTERIES


EUCLIDS
are made for
TOUGH JOBS
Dependable day-in and day-out performance has made Euclids the favorite off-the-highway hauling equipment for the toughest mining and construction jobs. Simple, rugged construction combined with large capacity and ample power and speed results in lower hauling costs for any material and any length of haul.
Here are a few of the Euclid features that are helping to keep hauling costs down for hundreds of contractor and industrial owners: designed and built expressly for heavy duty off-the-highway service . . . powerful and efficient full floating drive axle of double reduction planetary type with full rear axle load carried on tapered roller bearings . . . large capacity, 15 to 32 ton payloads . . . top speeds of 21.8 to 34.4 m.p.h. . . . wide range of usefulness — efficient for handling all types of material on any haul.
Your Euclid distributor or representative is at your service to provide detailed information on the Euclid models best suited to your hauling needs.

The EUCLID ROAD MACHINERY Co. • • • Cleveland 17, Ohio

EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH ROCK COAL ORE

Almost Every Coal Mine Wants And Needs "AUTOMAT" Loader Service...

—and many mines are reaping the benefits from the "Automat's" exclusive features, great adaptability and extraordinary service-ability.

Yet, there are operators who do not realize that the Whaley "Automat" will consistently load, in its stride, day in and day out, any lump of coal that will pass through their tipple, or any lump of rock your cars, aerial tram or larries can take.

This means, in fact, that whether you are doing coal, rock, or whole seam loading, you can depend upon the "Automat." Of course, almost any other loader will, for a while, handle rock or whole seam loading, but for consistent heavy duty service, at maximum production rates, it takes the "Automat," with its natural shovel action . . . its wide, large volume capacity conveyors, to do the job.

Almost every coal mine needs and should have this complete service, and therefore, most every coal mine needs the "Automat." It's the mechanical loader you should check up on now. Myers-Whaley Company, Knoxville 6, Tennessee.

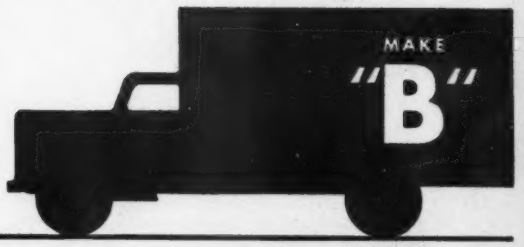
Wm. Neill & Son, Ltd., St. Helen's Junction, Lancashire, England, are licensed for Manufacture and Sale in Great Britain and Europe.

MYERS-WHALEY

Mechanical Loaders Exclusively For Over 38 Years

HERE'S IMPARTIAL PROOF MACKS LAST LONGEST!

1. FACT: *14% of all Mack Trucks on the road today were built before 1929... every seventh Mack is over 16 years old.*



2. FACT: *Closest runner-up, make "B" has only 10.3% trucks on the road with 16 years service to their credit.*

3. FACT: *Make "C" has only 7.8% trucks now in use 16 years.*

4. FACT: *Make "D" has only 6.6% of their trucks still operating after 16 years.*

(The basic figures are from the latest authoritative national survey of truck registrations, by R. L. Polk & Co.)

MORE Mack Trucks are still rolling profitably for owners—years after they've paid for themselves in dependable service—than any other make.

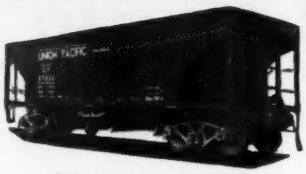
Mack
TRUCKS
FOR EVERY PURPOSE

Performance Counts!

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts.

(3) The Covered Hopper Car

(2) The Tank Car



(1) The Hopper Car

(4) The Livestock Car

(5) The Refrigerator (P.F.E.) Car

(6) The Box Car

(7) The Gondola

(8) The Flatcar

(9) The Automobile Car

Transportation Tailored to *your* INDUSTRY

To most effectively meet the needs of American Industry, Union Pacific provides a fleet of freight cars specifically designed to transport all types of materials and merchandise.

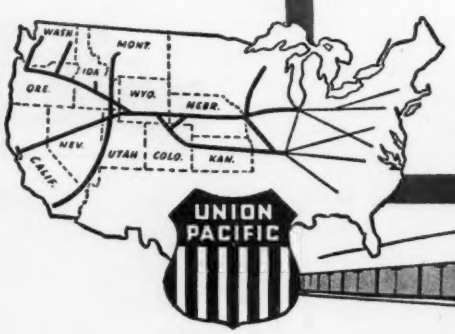
Sturdily constructed and efficient in mechanical operation are the various types of freight cars pictured on this page. This safe, dependable rolling stock is a vital factor in providing transportation for the commerce of the nation.

Of special interest to the Mining Industry is the hopper car, Fig. 1, used for the shipment of raw materials and finished products.

The trained knowledge and experienced skill of thousands of Union Pacific employees keep shipments rolling on schedule over the time-saving Strategic Middle Route, uniting the East with the West Coast. Experienced traffic specialists, from coast-to-coast, are ready to assist you. Let them help you with your *next* shipment.

For fast, dependable service . . .

be Specific – say "Union Pacific"



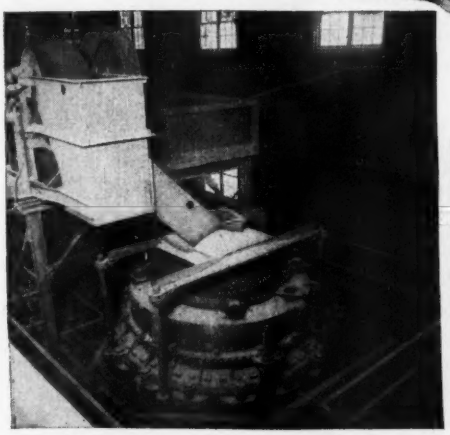
★ *Union Pacific will, upon request, gladly furnish industrial or mercantile concerns with information regarding available sites having trackage facilities in the territory it serves. Address Union Pacific Railroad, Omaha 2, Nebraska.*

UNION PACIFIC RAILROAD

The Strategic Middle Route

CONVEYORS BY LINK-BELT *Keep Things Moving* AT CLIMAX!

Link-Belt belt conveyors elevate crushed ore and discharge it to any desired bin by motor-propelled tripper.



Link-Belt belt conveyor feeding ore to a Symons shorthead cone crusher.

Link-Belt belt conveyors serving one of the screening operations at the Climax Molybdenum Co. Mine.

RIGHT TYPE OF LINK-BELT CONVEYOR ON EACH JOB KEEPS OPERATING COSTS LOW!

Selecting Link-Belt conveying equipment for the vital function of keeping material on the move, the engineers of the Climax Mill assured dependable, low-cost handling. Each application is given the type of conveyor best suited to its requirements. An apron conveyor feeds a huge tonnage of rock to a Symons cone crusher. Belt conveyors carry ore through the various stages in the crushing plant. Screw conveyors place dried concentrates in packing bins. In every instance, Link-Belt design and construction safeguards the performance and minimizes the operating and upkeep costs.

For every materials handling and conveying requirement, Link-Belt specialists can provide the right type of equipment.

10,279

LINK-BELT CONVEYORS

PREPARATION EQUIPMENT . . . POWER TRANSMISSION MACHINERY

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

Training Supervisors in Preventive Maintenance

Better Supervision Through the Knowledge of Machines Will Result in Higher Operating Efficiency

By JOHN HARSANY

Mine Superintendent
The New River Company

THE question of equipment maintenance in coal mining is becoming of greater and greater importance each year and there have been a number of excellent articles written and committee reports prepared on ways to train mechanics and electricians. There is, however, another side to this subject, and believing that supervision is of equal importance to maintenance, our company has recently adopted a program which combines the two and has given all of our underground supervisory force —general foremen, section foremen and face foremen—a course of instruction which we call "first-aid training in preventive maintenance."

For many years the coal industry has seen the benefits of first-aid training for the treatment of injuries, but we all know that it was never the idea to make doctors of our first-aid crews. Following this same line in thought, it is not the intention of our company to make electricians out of our supervisors. However, just as a knowledge of first-aid serves to encourage safe practices and prevent accidents, so does a working knowledge of the equipment and an understanding of how it is built, tend to secure proper operation and reduce mechanical breakdowns.

However, the training does much more than that; in spite of all care and precaution, machines will get out of order and at such times it is a great cost saver for a supervisor to be able to analyze the trouble for what it really is—whether it is a minor wear or misadjustment which can be corrected on the job or whether it is a major breakage which requires shop repairs. Also, to be able to report trouble correctly to the chief electrician. In addition, through proper mechanical knowledge, the need for a minor repair or adjustment can be recognized before big trouble develops and a very valuable part of our training has been to enable the supervisors to "nip the trouble in the bud." In other words, our primary objective is to make each foreman thoroughly acquainted with the equipment under his charge.

Instruction Courses

Two courses of instruction, designed for conveyor mining, are shown on the accompanying charts, which are to some degree self-explanatory. The first course of study, shown on Chart A, is largely what might be termed classroom work, although most of the classes are held in the repair shops. As will be noted, there is a thorough discussion of the maintenance procedure for the machines which are used in a conveyor panel, such as starters, undercutters, drills, motors, conveyors, etc. This phase of the instruction, in addition to explaining thoroughly the complete assembly of each machine, goes further by dismantling, demonstrating the functions of the various parts, and reassembling. Sources of trouble are, of course, pointed out as the dismantling and reassembling continues so that common causes of delays can be easily recognized and, in addition, the costs of repair parts are included so the men will see that not only time but money is to be saved.

The final course, as outlined in Chart B, is mostly given underground after the instruction in Chart A has been completed. This phase of the training covers the equipment in ac-

(*Continued on page* 77)

Lochgelly Tipple, The New River Co.

INSTRUCTION CHART FOR MACHINE MAINTENANCE
CHART A

Conveyor Starters

1. Dismantle
   - Check for defective parts.
2. Reassemble
   - Be sure all connections are tight.
   - Adjustments of contacts and setting of overload.
3. Explanation (as to operation or how starters work)
   - Positive and negative contactors.
   - Accelerating contactors.
   - Resistance.
   - Load of motor determines operation of accelerating coil.
4. Naming of parts as operation is explained
5. Importance of fusing properly
   - Overfusing will burn up operating coil.
   - Proper fuse will protect control line and coils.
6. Setting starter in proper place
   - Clearance (electricians may do this job quicker).
   - Level.
   - Contactors will operate freely.

Shortwall Machines

1. Dismantle machine
   - In dismantling check for all defective or worn parts.
   - Check for poor lubrication.
   - Check cutter bar (for looseness, chain for wear).
2. Explain
   - Operation of machine motor.
   - How machine should be operated.
3. Reassemble
   - How fields should be installed.
   - How armature should be installed.
   - How brushes should be installed (proper setting).
   - How controller should be installed (proper adjustment).
   - Improper adjustment (effects).
4. How frictions should be built up
   - Operation.
   - Affects of defects on controller, fields, armature, brushes.
5. Lubrication
   - Affect on parts.
   - Cost of each part.
   - Gumming of bit clutch.
   - How often and when to lubricate.
6. Proper bit setting
7. Adjustment of cutter chain

Conveyor Motors

1. Dismantle
2. Reassemble
   - Discussion on fields, wiring.
   - Shunted motor, affects on armature, bearings.
   - Affects on motor in general.
   - Open circuits, short circuits (effects).
3. Care in installing bearings
   - Cleanness.
   - Proper lubrication.
   - Bearing fits.
4. Installation of brushes
   - Proper setting.
   - Commutation.

Speed Reducers

1. Care of speed reducer
   - Vent on top for air escape.
   - Packing and seals.
   - Oil and oil level.
   - Care or maintenance.

Plain Bearings

1. Wear on bearings, on head shaft
   - Lubrication (importance).

Elevator Heads

1. Adjustments
   - Drive chain.
   - Proper setting of motor.

Tail Piece

1. 10 H.P. tail piece or cat head
   - Adjustment of bearings.
   - Adjusting screws.
   - Pan bolts.
   - Lubrication.
2. Shearing hub
   - Adjustment.

Duck Bill Drives and Shovel

1. How drives should be set
   - Level.
   - In line with pan line.
   - Jacks should be tight.
   - Clearance.
2. Causes of defective parts
   - Not set level.
   - Pan bolts loose.
   - Cradles not level with pan line.
   - Broken connecting eyes.
   - Improper lubrication.
   - Loose jacks.
   - Low oil in drive.
   - Oil seals.
3. Above defects, improper maintenance, will cause bearing trouble and breaking of parts inside of drive.

Junction Box

1. Dismantle and reassemble
2. Explanation on operation.
3. Care of box and plugs.
4. Importance of proper fusing.

Coal Drill

1. Dismantle and rebuild.
2. Checking all parts as drill is reassembled—armature, brushes, fields, switches and fuses.
3. Care and proper handling of drills.
   - Don't allow it to be thrown across pan line.
   - See that brace is on drill.
   - Explain cost of drill parts.

Motors that Won't Start

1. Trouble:
   - Open series field.
   - Open interpole field coil.
   - Brushes stuck, not making contact.
   - Bearings stuck, may be caused from lubrication.
   - Open circuit in starter.
   - Open circuit in feeder or cable to motor.
2. Motor won't run up to speed:
   - Shorted coils in armature.
   - Open circuit in armature.
   - Motor running on resistance.
3. Motor runs too fast:
   - Shunt field coil open circuited.
   - Air gap too wide between fields and armature.

Reporting Substandard Equipment

1. Before serious trouble develops.
2. Write work order, don't delay.
3. Keep bolts tight and check.

Discuss Trouble Correction Chart in Detail and Illustrate Where Possible

TROUBLE CORRECTION CHART

Trouble	Its Cause	What To Do
Car hoist won't run.	1. Blown fuse. 2. Lead broken. 3. Defective motor. 4. Switch not going in. 5. Switch won't contact.	1. Replace fuse. 2. Splice lead. 3. Call electrician. 4. Bend contact work. 5. Call for new switch box.
Hoist won't hold cars.	1. Brake need adjusting. 2. Brake not on.	1. Take up on brake nut. 2. Put brake on.
Hoist runs, but won't pull cars.	1. Rope broken. 2. Hoist anchor pulled out. 3. Hoist out of gear. 4. Rope loose on drum. 5. Pinion stripped.	1. Splice Rope. 2. Reset hoist. 3. Put in gear. 4. Put back on drum. 5. Call electrician.
At main conveyor—breaker in and controller on, nothing runs.	1. Fuse blown. 2. Cables disconnected. 3. Trolley wire clip off. 4. Power cable broken. 5. Faulty breaker. 6. Faulty controller. 7. Ground wire loose.	1. Replace fuse. 2. Plug up. 3. Pull cut-out switch, put clip on. 4. Splice cable. 5. Call electrician. 6. Call electrician. 7. Check and put back.
Elevator won't run.	1. Blown fuse. 2. Reverse set on centers. 3. Plug pulled. 4. Fingers not making contact.	1. Replace fuse. 2. Set reverse. 3. Plug in. 4. Adjust fingers.
Elevator motor runs, chain won't	1. Too much slack in chain. 2. Shear pin sheared. 3. Broken drive chain. 4. Sprocket slipping on shaft.	1. Take up adjusting screws. 2. Put in new pin. 3. Splice chain. 4. Put in new key.
Chains shearing pins on room or mother conveyor	1. Bent flights. 2. Something in tail piece. 3. Chain stripper bent. 4. Chain riding out. 5. Too much slack in chain. 6. Coal hanging-piled up. 7. Dirty pan line. 8. One side of chain broken. 9. No bolts in pan. 10. Defective tail piece. 11. Defective track under head. 12. Lip joint in pan line.	1. Take out or straighten. 2. Take out. 3. Straighten. 4. Block up line and alignment. 5. Take up slack in chain. 6. 20" clearance over head. 7. Clean line. 8. Replace chain. 9. Bolt up pans. 10. Put on new tail piece. 11. Drive track temp. repairs. 12. Level pan line—put in pan bolt.
Room line won't run.	1. Switch not in. 2. Fuse blown in starter. 3. Overload switch out. 4. Control cable broken. 5. Defective motor.	1. Put in. 2. Replace fuse. 3. Put in. 4. Splice cable or bridge at plug. 5. Call electrician.
Breaker at boom won't go in.	1. Bad breaker.	1. Call electrician.
Face conveyor won't run.	1. Fuse blown in switch. 2. Reverse on centers. 3. Cable broken. 4. Resistance leads loose. 5. Fuse blown in junction box.	1. Replace fuse. 2. Put on points. 3. Splice wires according to color. 4. Put back on. 5. Replace fuse.
Face, conveyor motor runs, but chain won't.	1. Pin sheared. 2. Post or coal hanging chain. 3. Pans out of line, unbolted.	1. Put in new pin. 2. Uncover line, remove post. 3. Bolt up pans.

TROUBLE CORRECTION CHART—Continued

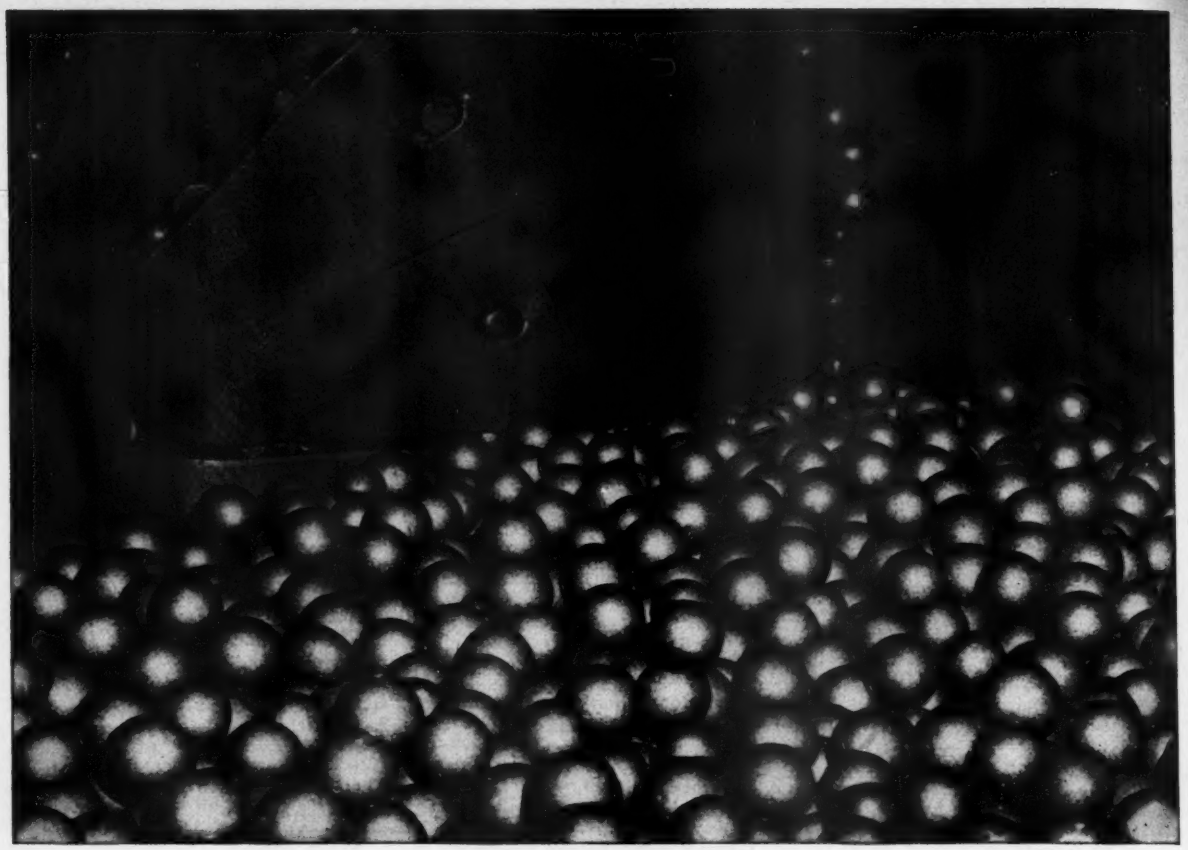
Drill won't run.	1. Fuse blown in drill. 2. Fuse blown in junction box. 3. Switch bad. 4. Cable broken. 5. Motor burned up.	1. Replace fuse. 2. Replace fuse. 3. Call for another drill. 4. Splice cable, report temporary splice to chief electrician. 5. Send to shop.
Drill motor runs, but won't turn bit.	1. Chuck broken. 2. Clutch slipping.	1. Send to pit. 2. Call electrician or send to pit.
Drill shocking operator	1. Frame ground off.	1. Put ground on.
Cutting machine won't run.	1. Switch out. 2. Cable Disconnected. 3. Fuse blown. 4. Open circuit in resistance. 5. Faulty controller. 6. Brush stuck.	1. Put in. 2. Plug up. 3. Replace fuse. 4. Call electrician. 5. Call electrician. 6. Clean and put down.
Cutting machine runs with controller off.	1. Power going in backward and resistance grounded.	1. Call electrician.
Machine runs too fast.	1. Shunted.	1. Call electrician.
Frictions won't work.	1. Need washing out.	1. Wash frictions.
Slow feed drum won't turn.	1. Need new discs. 2. Bit or bolt in gear.	1. Call electrician. 2. Remove.
Cutter chain hung.	1. Chain too loose. 2. Wearing strip loose.	1. Tighten chain. 2. Repair.
Controller hung on cutting machine	1. Slate in gear. 2. Interlock. 3. Fingers out of adjustment.	1. Take out. 2. Call electrician. 3. Adjust fingers.
Starter won't operate.	1. Control cable broken. 2. Coil burnt up. 3. Resistance broken. 4. Starter not level. 5. Relay kicked out.	1. Splice cable. 2. Call electrician. 3. Splice temporary, get new set. 4. Set level. 5. Push reset button.
Starter getting hot.	1. Contact not going in.	1. Adjust.
Conveyor and cutting machine motor knocking breaker.	1. Brushes firing. 2. Ground-brush holder. 3. Open circuit, and grounded lead.	1. Put tension on spring. 2. Call electrician. 3. Call electrician.

tual operation—causes of trouble and ways to correct them are shown in detail and in some cases are artificially demonstrated by a deliberate misadjustment of some part of the equipment.

The instructors are the chief mine electrician and his assistants. Each course as shown in Charts A and B require a total of 35 hours, with classes lasting about four hours at a time. The men are taken in groups of 12 to 15.

So far, 35 of our foremen have been trained, but as the training has been completed only recently, it is too early for us to say just what benefits will be derived. Actually, we may never be able to measure these benefits in dollars and cents, but based on the interest shown, we do feel that a higher operating efficiency and fewer delays are certain to result.

Production and safety records are posted daily



Hard at Work at CLIMAX MOLYBDENUM MINE, Climax, Colo.

MOLY-COP

TRADEMARK REG.

COPPER-MOLYBDENUM-ALLOY

Grinding Balls

Reduction of ore at the Climax Molybdenum Mine calls for the best in grinding media.

In a battery of 9 ft. x 8 ft. ball mills at the Climax Molybdenum Mine, Sheffield Moly-Cop Grinding Balls have demonstrated, for a number of years, their ability to grind far more tons of ore per ball.

One of these mills was stopped recently and the above photograph taken without special preparation. Note how Sheffield Moly-Cop Grinding Balls retain their spherical shape throughout almost all their longer service life without flaking or spalling.

Moly-Cop Grinding Balls cut grinding costs. Prove this fact to your own satisfaction in your own mills.

SHEFFIELD STEEL CORPORATION

HOUSTON **KANSAS CITY** **TULSA**

Export Representatives

Canada—The Canada Ingot Iron Company, Ltd.
Guelph, Ontario, Canada

All Other Countries—
THE ARMCO INTERNATIONAL CORPORATION
Middletown, Ohio

SHEFFIELD STEEL

ALLOY STEEL FORGED HEAT-TREATED

WHEELS OF GOVERNMENT

Washington Highlights

CONGRESS: Departing for five months.

OPA: Gets year's extension. Premium Price Plan included.

STOCKPILING: S. 752 is now law.

SAFETY CODE: Promulgated for coal mines.

SILVER: Murdock-Martin law sets 90.5 cent price.

GOLD: Producers request for export denied.

GWYNNE BILL: Suit limitation expanded to three years.

FOREMEN'S UNION: Government signs contracts.

ATOMIC ENERGY: Strong law enacted.

SECRETARY KRUG: Creates Bureau of Land Management.

FREIGHT RATES: Railroads ask 25 percent increase.

POISED on the eve of adjournment the Congress has disposed of all departmental and Federal agency appropriations bills, and with a great many of its members now campaigning in the home districts and states, is transacting business mainly under unanimous consent procedure. The prospect is that the vacation will be a long one, probably extending until the 80th Congress convenes in January, 1947.

Price Control Extended

The White House veto of the OPA bill at the end of June was quickly followed by House passage of a resolution to extend that agency to July 20. The Senate proceeded to rewrite the vetoed bill and with House concurrence the measure was sent to the President July 24 and became law at 4:05 p. m. July 25.

Chief differences between the first and second OPA bills placed before the President were, (1) revision of the "Taft formula" into a version basing current prices on the 1940 calendar or fiscal year prices, plus average increases in costs since then (OPA is authorized however to ignore the new formula when a producer is making current production costs plus a reasonable profit); (2) creation of a Decontrol Board to rule on whether a commodity shall be decontrolled or recontrolled.

Further provisions of the law call for decontrol of all non-agricultural commodities not important to business or living costs by the end of the year, with elimination of all controls mandatory where supply and demand are in approximate balance. OPA is forbidden to control prices of any farm commodities not certified by the Department of Agriculture to be in short supply. The Decontrol Board is authorized to rule on appeals by industry advisory committees for decontrol of products. The $100 million provision for copper, lead and zinc premium payments is in the law, including the McFarland amendment extending the Premium Price Plan as placed in the bill by the Senate. The law is made effective as of June 30, 1946.

Members of the Price Decontrol Board appointed by the President are Roy L. Thompson, president of the New Orleans Federal Land Bank; Daniel W. Bell, president of the American Securities & Trust Company of Washington and previously Undersecretary of the Treasury; and George H. Mead, Dayton, Ohio, business man and member of various industry advisory groups dating back to the days of NRA. The OPA Administrator has asserted that "all ceilings go back to where they were on June 30, except where the new law specifically makes other provision."

Maximum prices on coal were reestablished at 4:05 p. m. July 25 at the levels effective on June 30. It is anticipated that individual price adjustments will be treated in the same manner as in the past.

As a precaution in case the OPA with its Premium Price Plan for copper, lead and zinc and the McFarland amendment had not become law, Senators and Representatives from mining states had introduced a bill extending the Plan for 12 months, on the same basis as in the first OPA bill agreed to by both Houses of Congress. Administration of the Plan would have been transferred to the RFC and premiums would have been calculated "on the basis of the monthly average price quotation in recognized trade journals in place of the prior figures of maximum prices." This bill would probably have been appended to the measure extending the life of the RFC, which has now become law. Steps were also in contemplation for the issuance of an OWMR directive to the RFC to continue premium payments for metals.

Stockpiling Law

By President Truman's signature on July 23 the Thomas-May Strategic and Critical Materials Stockpiling Act is now designated as Public Law No. 520—79th Congress. Immediately the Departments of War and Navy requested an appropriation of $250 million to purchase materials under the Act. The request was not granted by the House Committee on Appropriations but the Senate Committee included the $250 million in the First Supplemental Deficiency Bill.

The White House issued a statement when the Stockpiling Act was signed asserting the President's criticism of the "Buy American" provision. The statement reads in part:

"It is only because of the overriding importance of this purpose that I am able to overcome my reluctance to signing a bill which reaffirms the application to stockpile purchases of the provisions of Title III of the Act of March 3, 1933 (47 Stat. 1520), known as the Buy American Act. Those provisions will not only materially increase the cost of the proposed stockpiles but will tend to defeat the conservation and strategic objectives of the bill by further depleting our already inadequate underground reserves of strategic materials. Furthermore, there can be a serious conflict between those provisions and the foreign economic policy which this Government is actively pursuing. It also seems to me that the application of the Buy American Act may frequently hamper the effective achievement of the essential pur-

pose of the legislation which is to enlarge the stock of vital raw materials available within our borders in time of possible emergency."

Silver at 90.5 Cents

The President on July 31 signed the Murdock-Martin bill which, in effect, carries the 90.5 cents per ounce price for the sale of unobligated Treasury silver to consumers and for payment by the Treasury to producers of newly mined domestic silver.

Following the prolonged battle over the silver "rider" in the Treasury-Post Office appropriation bill the Murdock-Martin measure was compromised and sent to the White House and the Treasury-Post Office rider was dropped.

Lost in the shuffle was the provision that would have increased the price to $1.29 as of July 1, 1948. It is specified in the law that the price shall be not less than 90.5 cents on sales of Treasury silver. The same price is set for producers of newly mined domestic silver by reducing the seigniorage on silver from 45 percent to 30 percent, when mined from domestic deposits subsequent to July 1, 1946, and tendered to the Treasury within one year after the month in which the ore was mined.

Coal Safety Code

On July 26 the Coal Mines Administration issued the Federal Mine Safety Code for bituminous and lignite mines as provided under the terms of the UMWA-Government contract. Interior Secretary Krug stated that periodic inspections of the mines will be made by representatives of the U. S. Bureau of Mines who will report violations of the Code through the Director of the Bureau of Mines to the Coal Mines Administrator. There are more than 300 separate standards in the Code including timbering, blasting, explosives, ventilation, coal dust hazards, transportation, electrical appliances, protective clothing, and numerous other phases of mine operation.

Gold Export Denied

The Treasury has refused to grant a request made by California gold producers under which newly mined gold could be shipped to foreign countries to obtain its market value in U. S. dollars through legitimate trade channels. The plight of the gold mining industry was carefully explained to the Treasury and the hope was expressed that "suitable arrangements could be made with American importers to supply foreign exchange necessary to enable them to pay for goods purchased in the countries to which bullion might be shipped, at standard rates of exchange, and the gold miner would then get the price of his bullion back in the form of dollars through this medium."

The reply from the Secretary of the Treasury stated that the proposed plan "would in fact be workable only if the import-export and foreign exchange laws of the countries involved were circumvented. In practically all of the countries the private importation of gold is prohibited except if specially licensed. Moreover, the sale of the local currency to a U. S. importer against a dollar credit in the United States would constitute a foreign exchange transaction. This transaction, also, would in almost all cases be prohibited unless specially licensed. . . . Apart from whether the proposed transaction would be, as a technical matter, legally permissible, such transaction would be detrimental to the economy of the foreign governments involved and would be contrary to the international financial and economic policy of the United States. Since all normal needs of any foreign country for gold can be filled under existing licenses or in any event at $35 an ounce, purchases beyond these needs at a higher price are not likely to be in the interest of the foreign country, and would, furthermore, diminish the ability of such country to pay for necessary imports from the United States and elsewhere."

Gwynne Bill

Passed by the Senate July 29, with amendments, and now subject to House concurrence, the Gwynne bill, H. R. 2788, may still encounter a White House veto. This is the measure limiting suits for back pay and "liquidated damages" under the Wage-Hour Act to two years. The Senate amended the bill to change the limitation to three years and accepted a revised draft directed only to the Wage-Hour Act and to the Walsh-Healy Public Contracts Act. The new version carries all of the provisions included in the bill as passed by the House including the paragraph which reads: "No liability under subsection (b) shall be predicated in any case on any act done or omitted in good faith in accord with any regulation, order, or administrative interpretation or practice, notwithstanding that such regulation, order, interpretation, or practice may, after such act or omission, be amended, rescinded, or be determined by judicial authority to be invalid or of no legal effect."

Foremen's Unions

In the current controversy over the unionization of supervisory employes, the U. S. District Court for the District of Columbia on June 25 dismissed an application for a preliminary injunction asked by Jones & Laughlin Steel Corporation, to restrain the Coal Mines Administration from negotiating a contract with the corporation's supervisory employes at four of its mines in Pennsylvania. The CMA on July 17 signed a contract with the United Clerical, Technical and Supervisory Workers Union (UMWA) covering pay and working conditions for the corporation's mine supervisory workers and clerical employes. Similar agreements were signed by CMA with the clerical and supervisory employes in the general office of the Industrial Collieries Corporation.

Atomic Energy

The Atomic Energy Bill sponsored by Senator McMahon of Connecticut, under which an Atomic Energy Commission of five would be given wide powers in the control of fissionable materials and "source materials" has gone to the White House for approval. A pitched battle staged by some members of the House Committee on Military Affairs, to secure a greater degree of control in the Commission and its organization for the Army and Navy, was finally composed by placing the Commission's Division on Military Applications under a representative of the armed forces. The Army and Navy will also be permitted to manufacture weapons and devices using atomic materials. The final composing of the violent differences which had arisen over the bill is reported to have been accomplished by the Army Chief of Staff, General Eisenhower.

Bureau of Land Management

Under this new title have been consolidated the General Land Office and the Grazing Service of the Department of the Interior. This action followed congressional approval of one of the President's plans to reorganize Government agencies. The new Bureau will have charge of leasing or disposal of minerals. The U. S. Geological Survey will function in this regard with respect to mineral lands, administration of which is to be transferred from the Department of Agriculture.

Meanwhile considerable interest has been aroused in a bill sponsored by Representative Barrett of Wyoming which has passed the House and which would provide for the sale of isolated or disconnected tracts of land leased under the Taylor Grazing Act. All minerals in the lands sold would be reserved to the United States. Ninety percent of the receipts from sales, except payment for cost of publication, would be paid to the states in which the land is situated. It should be particularly noted that a provision is included in the bill under which "no sale shall defeat any valid right which has already attached to the land under any pending entry or location."

(*Continued on page* 84)

Personals

James Marsh, consulting geologist of Salt Lake, formerly in charge of war mining development in the Salt Lake area for the U. S. Bureau of Mines, and prior to that chief geologist for the Utah Copper Co., has been appointed chief geologist of the Union Pacific Railroad, with headquarters at Los Angeles.

A. H. Waugh has been elected president of the Champion Coal Co., a wholly owned subsidiary of Pittsburgh Consolidation Coal Company. Mr. Waugh has been associated for 26 years with the company, which retails Pittsburgh Consolidation's coal in western Pennsylvania.

H. K. Babbitt, production manager of the Special Products Section of the Du Pont Company's Explosives Department, retired early in July. A graduate of Iowa State College, Mr. Babbitt served 40 years with E. I. Du Pont de Nemours and Company, Inc. Mr. Babbitt was born in Chicago and is 62 years of age.

Clem P. Pollock has been transferred to the New York offices of the American Smelting and Refining Co. He has been replaced by **Keith Whiting**, who has been appointed geologist of the northwestern territory of the company.

Eugene McAuliffe, chairman of the Union Pacific Coal Company's board of trustees and former president of the Union Pacific Coal Company, and **Mrs. McAuliffe** celebrated their golden wedding anniversary in June at their home in Omaha. Approximately 300 guests were received in an open-house reception and many came from out of town to offer congratulations to Mr. and Mrs. McAuliffe.

J. C. Richards, Jr., Virginia, Minn., has joined the engineering department of the Oliver Iron Mining Co., at the Hibbing district offices on the Mesabi iron range. Mr. Richards, a former captain in the Marines, participated in four invasion landings on the European battlefront. He has only recently been released from the service.

E. M. Douthat, who has been associated with Sinclair Coal Co. for more than 30 years, has withdrawn from active participation in the management of the coal company's properties in order that he may devote his entire time to further development of Locke Stove Co., in the manufacture and nationwide distribution of coal heaters.

A. C. Barrett resigned his position as office manager of the Getchell Mine, Inc., in June. He will be replaced by **L. L. Lichlyter**, who has been at the mine since November, 1945.

Dr. Clyde Williams, director of Battelle Institute, Columbus, Ohio, was recently presented the honorary degree of doctor of science at the University of Utah at Salt Lake City. Dr. Williams is an alumnus of the

university. The degree was presented by Dr. A. R. Olpin, president of the University of Utah, who cited Dr. Williams' accomplishments in research administration and in directing the activities of the War Metallurgy Committee of the National Academy of Sciences and the National Research Council.

Consolidation Coal Co. (Ky.) announces the appointment of **Damon C. Duncan** as superintendent of its Central Shops at Jenkins, Ky., effective July 16, 1946. Due to the resignation of **Jack McClellan**, superintendent of the company's Building & Rent Department, the functions of that department are placed under the supervision of Mr. Duncan.

R. W. Mason, Jr., formerly associated with The Lithium Company, Newark, N. J., has joined the Development and Research Division of The International Nickel Co., Inc. Mr. Mason graduated from Michigan State College in 1937. He will serve in the Detroit office as metallurgist and consultant to consumers and producers on the use of nickel in ferrous and nonferrous castings.

At a recent meeting of the Alabama By-Products Corp., **John W. Porter**, president, retired from this position and was replaced by **Phil H. Neal**, assistant to the president and associated with the company since its formation in 1920.

Frank A. Ayer, consulting engineer for the Copper Range Co. at Painesdale, Mich., was recently elected vice president of the Copper Range Co.

Emerson H. Todd has been appointed sales manager of American Cable and Hazard Wire Rope Divisions of American Chain & Cable Co., Inc., succeeding **Frank W. Bemis**, who resigned to enter business in Omaha, Nebr.

F. W. Koelling, of Dawson, and **Horace Moses**, of Hurley, N. Mex., were elected to the executive board of the Rocky Mountain Coal Mining Institute at its 42nd annual conference at Denver in June. **Paul L. Shields**, Salt Lake City, was elected president.

James H. Pierce, president of Pierce Management Inc., engineers and mine managers, was awarded an honorary degree of doctor of engineering at Lehigh University on June 23.

C. M. Shaeffer, vice president and general manager of Attapulgus Clay Co. since 1922, retired June 30. **E. H. Stockton**, for many years assistant manager of the Fullers Earth Plant at Attapulgus, Ga., will assume duties previously assigned to Mr. Shaeffer.

Captain Oscar L. Carlson has been appointed by Admiral Ben Moreell, Coal Mines Administrator, to take charge of the Pittsburgh area. Captain Carlson is a native of Montclair, N. J., where he once served as mayor of the city. He has had a distinguished record in both World Wars. Captain Carlson has jurisdiction over Production Districts 1 and 2 in central and western Pennsylvania, District 3 in northern West Virginia, District 4 in Ohio, and District 6 in the West Virginia Panhandle.

The appointment of **Colonel James Boyd** as dean of the faculty of the Colorado School of Mines has been announced by Dr. Ben H. Parker, president of the school. The appointment becomes effective September 1.

Colonel Boyd has been directing industrial operations in the American zone of German occupation as a deputy to Lieutenant General Lucius D. Clay. He has been specially charged with the direction of all industrial operations except those relating to iron and steel. He recently represented the United States in the four-power negotiations regarding the status of industry in Germany after the withdrawal of reparations. For his work in Germany he has been awarded the Oak Leaf cluster to the Legion of Merit award.

The new dean is a graduate of the California Institute of Technology and received the doctor of science degree from the Colorado School of Mines in 1934. He was a member of the faculty of the department of geology at the Colorado School of Mines until 1940, when as associate professor of geology, he took a leave of absence to become chief of the metals office in the office of the Undersecretary of War.

Dr. Helgi Johnson has been appointed acting director of the Rutgers University bureau of mineral research. He succeeds **Dr. Alfred K. Snelgrove,** visiting professor of geology, who has returned to the Michigan College of Mines and Technology. This bureau was established last year to study New Jersey's mineral resources.

On July 31 **B. Helm Stockett,** general manager of the Locust Coal Co. of Shenandoah, a subsidiary of Weston Dodson & Co., Inc., and one of the best known men in the anthracite industry, retired from business due to ill health. A. C. Dodson, president, Weston Dodson & Co., announced that Mr. Stockett will be succeeded by **Joseph J. Crane,** who has been assistant general manager of Locust Coal.

Mr. Stockett has been associated with Weston Dodson & Co. since 1913, when he came with the company as superintendent and engineer for the old Locust Coal Co. at Shenandoah. Previously he had been employed as mining engineer by the Lehigh Coal & Navigation Co. at Lansford. Mr. Stockett is an authority on stripping and was a pioneer in the use and development of electric draglines for this work.

Mr. Crane has been associated with Weston Dodson & Co., Inc., since 1914, and in 1925 became mines accountant for all of Dodson's anthracite operations. In April, 1938, he was promoted to the position of assistant to General Manager Stockett, and became assistant general manager in July of the same year.

Lt. Col. Fred G. De Berry has returned to his home in Georgetown, El Dorado County, Calif. After five years in active duty with the Corps of Engineers, he will resume his profession as mining engineer and metallurgist in El Dorado County.

The American Society for Metals has announced the bestowal of the Albert Sauveur Achievement Award for 1946 on **Dr. Edgar C. Bain.** A former president and director of the society, and past chairman of its New York chapter, Dr. Bain is vice president in charge of metallurgy and research for the Carnegie-Illinois Steel Corporation at Pittsburgh. The award will be presented at the society's annual dinner on November 21 at Atlantic City.

Frank E. Briber, one of the original organizers of Denver Equipment Company, has resigned from the position of secretary and director of the firm. His present address is 5045 E. 17th Avenue, Denver 7, Colo.

Richard M. Foose, senior geologist of the Pennsylvania Geological Survey, Harrisburg, Pa., has resigned from that position, effective September 1, and will accept the post of professor of geology and head of the department of geology at Franklin and Marshall College, Lancaster, Pa.

— *Obituaries* —

Walter Maynard Drury, vice president of the American Smelting and Refining Co., died on July 17 of a heart attack at Santa Barbara, Calif. Mr. Drury was born in 1880 and received a bachelor of science degree from the Massachusetts Institute of Technology in 1903. That autumn he entered the employ of the American Smelting and Refining Co., with which he remained throughout his entire career. From 1913 until his election to the vice presidency in 1944, Mr. Drury was general manager of the company's metal mining department in Mexico. At his death he was a director of several corporations, including Cia Minera Nacional, Montezuma Lead Co., Brandreth Manufacturing Co., and Towne Securities Co.

Edward Sutton, Sr., deputy state coal mine inspector for southern Wyoming, died in June at the veterans' hospital at Cheyenne, Wyo.

Everard Leland, well-known mining engineer and manager of the Colombia gold-mining interests of the Canadian Timmins Ochali Mining Co., died early in July after a three months' illness. Well known in mining circles throughout the United States, Canada, Mexico and Colombia, Mr. Leland contributed to technical publications in the field and was responsible for several innovations in mining techniques.

George S. Mumford, chairman of the board of the Calumet and Hecla Consolidated Copper Co., died July 15 at the age of 79, at Chestnut Hill, Mass. Mr. Mumford, a graduate of Harvard in 1887, was named chairman of the board of directors of Calumet and Hecla Copper Co. in 1933.

William Patrick Newman, retired purchasing agent of Robins Conveyors Inc., division of Hewitt-Robins Inc., died after a brief illness July 17. Mr. Newman joined Robins in 1899, coming there after a brief association with the inventor, Thomas A. Edison. During the ensuing 47 years with Robins he held several important positions and was for more than 25 years Robins' purchasing agent, which post he occupied until his retirement on pension July 1.

Charles L. Lawton, general manager of the Quincy Mining Co. of Hancock, Mich., died at his home on July 23. A graduate of Michigan State College he later studied at the Michigan College of Mining and Technology at Houghton where he received his M.E. degree. His early mining career took him to Wisconsin, Colorado, North and South Carolina, Pennsylvania and Utah. Since 1905 Mr. Lawton has been manager of the Quincy Mining Co., and for a number of years was president of the Superior National Bank & Trust Co.

NEWS and VIEWS

The plant of the Colorado Fluorspar Co., at Salida produces between 40-50 tons of ceramic grade spar per day

Eastern States

New Man Trip Cars Used

Pursglove Coal Mining Company made history in June when workers at the No. 15 Mine traveled to their working places in covered cars built strong enough to withstand roof falls and insulated against accidental contact with the trolley wire. These new cars, the first of their kind to be used in northern West Virginia, hold 38 men each, and the three now in use at No. 15 have a total capacity of 114 men. The Pursglove Company carried on exhaustive tests before purchasing the new cars and considerable preliminary work was required to widen curves and provide additional clearance on the tracks. It is generally considered that these cars represent one of the most important advances in safety in this coal-mining region.

Spindler Stresses Safety at Meeting

The Central West Virginia Coal Mining Institute, attended by approximately 150 State and Federal inspectors and other mining men, held its largest meeting of the season on Friday, July 12, at Webster Springs, W. Va. The speaker of the evening, G. R. Spindler, chief of the West Virginia State Department of Mines, was introduced by President E. Frank Miller, Federal divisional superintendent of the Koppers Coal Company.

Mr. Spindler, in his talk, set forth the policy and function of the State Department of Mines. He pointed out that in 1945 West Virginia saw its best accident record in its history, with the least number of fatalities per million tons of coal mined. The state's record as a whole for last year was approximately 550,000 tons produced per fatal accident. By and large, 60 per cent of those accidents were caused by roof and rib falls. Of the 46,000,000 tons of coal produced last year in Central West Virginia, which is approximately one-third of the state's total production, only about one-fifth of the state's mining accidents occurred in this same region.

Chief Spindler, in citing contributing factors that cause accidents, showed how dangerous conditions and dangerous practices present together cause accident frequency to shoot sharply upward. He urged more timbering of the unexposed and recently exposed roofs, the characteristics of which are unknown because of lack of time to study them.

The speaker stated the purposes and functions of the Department of Mines as follows: to promote sound economical health to the mining industry; to inspect the underground workings; to enforce the state mining laws; to investigate and do research in an effort to analyze mining problems; to formulate statistics; and to educate the industry for safety.

Opening of New Coal Field Considered

It is reported that a group of Northern West Virginia business men are considering the opening of a new coal field in the northern part of Barbour County and in the Elk district of Harrison County. Work under consideration includes the construction of roughly six miles of railroad track, a 2,000-ft. tunnel between Simpson Creek and Elk Creek, the erection of several small bridges and the opening of several coal mining operations. Preliminary surveys for the railroad line are already underway and would extend from the present B. & O. track at Berryburg to Elk Creek. Very nearly 2,000 acres of coal lies in the proposed new field and once a railroad is installed into this area, mining operations can be started. It is understood that such operations would embrace both strip and shaft mining. Both the Redstone and Pittsburgh seams are involved in this region.

F. CARL COLCORD
Consulting Engineer
Coal land valuations, Mine installation and operation
1132 Union Trust Bldg. Cincinnati, Ohio Phone Cherry 5403
Box 268 Paris, Ky. Phone 643

MARSHALL HANEY, Ph.D.
Consulting Mining Engineer
Examinations Reports Appraisals
1103 Flower Ave. Takoma Park, Md.

Officers Elected at Meeting

At the annual meeting of the Pennsylvania - Anthracite Section of American Institute of Mining and Metallurgical Engineers, held at the Valley Country Club, Hazleton, Pa., on July 13, the following officers were elected:

Harry W. Montz, Wilkes-Barre, chairman; C. A. Garner, Hazleton, vice chairman; Floyd S. Sanders, Dallas, secretary-treasurer. Executive committee for three years: Joseph E. Ward, Hazleton; Cadwallader Evans, Jr., Scranton; Edward Griffith, Wilkes-Barre; W. C. Muehlhof, Pottsville; and W. E. Conroy, Clarks Summit.

Industrial Hygiene Foundation Elects Officers

The election of Arthur Batts, president of the Carborundum Company, Niagara Falls, N. Y., and M. W. Thompson, treasurer and general manager of the Hall China Company, East Liverpool, Ohio, to the board of trustees of Industrial Hygiene Foundation is announced by Andrew Fletcher, chairman.

Mr. Fletcher, vice president of the St. Joseph Lead Company, New York, explained that Mr. Batts will represent the grinding-wheel industry on the Foundation's board and Mr. Thompson the pottery industry. Both industries have been identified with the Foundation almost from its organization 11 years ago.

Mr. Fletcher also announced that the annual meeting of Foundation's member companies will be held at Mellon Institute, Pittsburgh, the Foundation's headquarters, on November 7 this year, a week earlier than usual. Round-table conferences will be held on November 6 and 8, the day before and the day following the general session.

These conferences, limited to representatives from member companies, are intended for physicians, engineers and chemists concerned with the maintenance of health in industry. The Foundation is a non-profit association of approximately 300 companies devoted to the improvement of physical working conditions and the advancement of industrial health.

Training in Mine Rescue Work

A circular based upon the protective system maintained at the Industrial Collieries Corp. in Johnstown, Pa., has recently been published. The training of mine officials in organizing rescue and recovery activities, thus avoiding panic at coal and metal mine disasters, is recommended by the Bureau of Mines as part of its nationwide accident - prevention program, according to Director R. R. Sayers. The plan as presented in the Bureau's publication calls for the development of initiative and leadership in mine officials, at least two crews of well-trained rescue men always available, and a procedure which will give effective control of personnel and operations during exciting and tense emergency periods. The accessories and equipment needed to combat a mine fire or explosion are listed as they are provided at the large coal corporation, and complete details of duties, organization, and equipment, together with several charts and illustrations, are included in the paper prepared by E. R. Maize, Bureau engineer, and J. V. Berry, a supervisor at the Industrial Collieries Corporation, who are stationed at Johnstown, Pa.

Copies of the publication, Information Circular 7353, "A Plan of Training Mine Officials in Rescue Organization and Disaster Prevention," can be obtained by writing to the Bureau of Mines, U. S. Department of the Interior, Washington 25, D. C.

Engineers Wanted

Experienced in estimating, layout and detailing of coal cleaning plants, coal tipples and material handling plants. Excellent pay and opportunities.

ROBERTS & SCHAEFER CO.
307 N. MICHIGAN AVENUE
Chicago 1, Illinois
Telephone—Central 7292
E. C. Molke, Chief Engineer

Wheels of Government

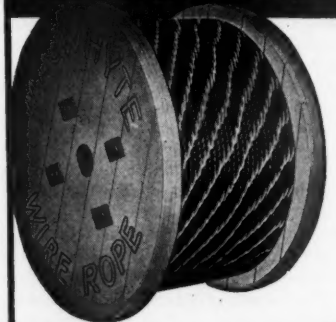
(*Continued from page* 80)

Freight Rates

As stated in the July issue the Interstate Commerce Commission is carrying on with hearings on the request of the railroads for a general 25 per cent increase in freight rates. The hearings, which began in Chicago July 22, have been completed and additional hearings will be conducted August 5 at Buffalo, N. Y.; August 8 at Atlanta, Ga.; August 12 at Galveston, Tex.; and August 12 at Salt Lake City.

The railroads have petitioned the ICC for a further emergency increase in freight rates on bituminous, anthracite and lignite coal and coke amounting to 15 cents a net ton or 17 cents a gross ton.

The CORRECT rope for your mining equipment



MACWHYTE
PREformed

- Internally lubricated
- Made from special steels
- Made by craftsmen with years of experience
- PREformed for longer, low-cost service

774-B

MONARCH Whyte Strand PREformed... Macwhyte's best grade wire rope... famous for its strength, toughness, and internal lubrication.

Request Catalog on your company letterhead!

170 pages of information. A request on your company letterhead will bring it to you promptly. Ask for Catalog G-15.

MACWHYTE COMPANY
2952 Fourteenth Ave., Kenosha, Wisconsin

Manufacturers of MACWHYTE PREformed and Internally Lubricated Wire Rope ... MONARCH WHYTE STRAND Wire Rope ... MACWHYTE Elevator Wire Ropes ... MACWHYTE Braided Wire Rope Slings ... MACWHYTE Aircraft Cables and Tie Rods

Mill Depots: New York, Pittsburgh, Chicago, Ft. Worth, Portland, Seattle, San Francisco.
Distributors throughout the U. S. A.

★ CAPACITY IS NO PROBLEM FOR S-D 1-2-3 "AUTOMATICS"

If you want 1½ ton or 25 ton capacity mine cars—it makes no difference about size—you can have them, along with increased production with fewer cars . . . decreased production costs . . . exclusive, automatic S-D "Jerk-Out" unlatching device, and other advantages to be found only in S-D 1-2-3 "Automatics."

To assure you the increased tonnage with fewer cars . . . the great decreases in operating costs . . . the savings in manpower and other costs reducing claims we make for S-D 1-2-3 "Automatics," the cars are tailored to fit your pattern. It's the engineering work, covering every detail, on each individual installation, as well as the famous 1-2-3 automatic principle of discharging coal that has made these remarkable cars so amazingly successful.

The 1-2-3 automatic principle of discharging is invariably the same, regardless of size or capacity of car . . . and it's equally effective on all cars regardless of capacity.

Coal mines everywhere are recognizing, more and more, that S-D 1-2-3 "Automatics" are essential engineered haulage equipment for modern mining. Mines with obsolete types of cars are changing over more rapidly than many operators realize. If you are thinking about new cars, you should do something about it now.

Sanford-Day Iron Works, Knoxville 9, Tennessee

Feasibility of Turbine Locomotive

One year's experimentation has demonstrated the feasibility of a railroad locomotive, driven by a gas turbine, powered by pulverized coal, members of the Locomotive Development Committee were told on July 10 at a meeting in the Hotel Biltmore, New York City, presided over by Chairman Roy B. White, president of the Baltimore & Ohio Railroad.

The meeting was held to review the accomplishments of the locomotive research program initiated a year ago by Bituminous Coal Research, Inc., through the joint efforts of six major railroads and three coal-producing companies. In his first annual report Dr. John I. Yellott, director of research, described the coal-handling system which makes use of the "coal atomizer" to pulverize coal to the necessary fineness, within the limitations of space and weight imposed by railroad locomotives. He also described the use of small cyclone separators to remove 95 per cent of the flyash from hot gas streams, which, freed from abrasive materials, may then be used to drive the turbine blades.

"One year's work has proved," Dr. Yellott said, "that the coal-fired gas turbine locomotive is practical. Through the discovery of means for removing the flyash from the burned coal, thus giving us non-abrasive gas to turn the turbine, we have gotten over a big hurdle. The new gas turbine locomotive will use electric drive. It will be able to operate without a tender and will need no water. It will be considerably more efficient in cold weather than in hot weather."

The committee has authorized the purchase of two full-size gas turbines and of special locomotives in which to mount them.

"The thermal efficiency of the gas turbine locomotive at the rails is approximately 20 per cent as compared with the present steam reciprocating locomotive of 5 to 8 per cent," said Dr. Yellott.

University to Prepare Atlas in Cooperation With Bureau of Mines

The U. S. Bureau of Mines and the University of Maryland will cooperate in the preparation of a world mineral atlas as recently announced by Dr. R. R. Sayers, director of the bureau, and President H. C. Byrd of the University of Maryland. In view of the importance of strategic minerals during the last war this atlas should be of unusual value at this time as an aid to postwar stocktaking and as a guide to future planning for the conservation of irreplaceable resources. Text is to be written by specialists and will include location of major mineral deposits, potential reserves, composition and grade of the ore, comparative production and consumption by countries, and facts on geology, mining and beneficiation, uses, substitutes and world trade with the United States.

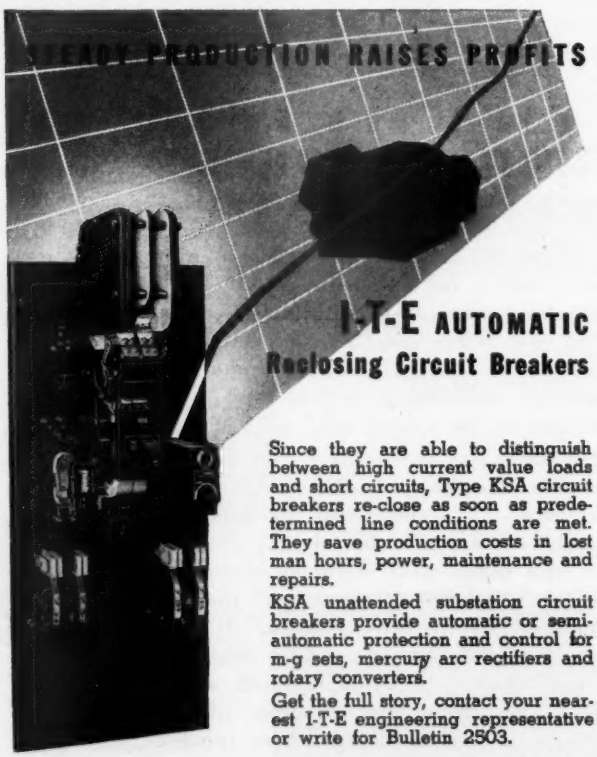
75th Anniversary of A. I. M. E. to Be Celebrated at March Meeting

The board of directors of the A. I. M. E. have voted to postpone the conference and 75th anniversary celebration until the week of March 17, 1947. Originally scheduled to take place this coming September 16 to 18, the change in plans was forced by unusual congestion existing at the present moment in New York hotels.

The plans for this meeting embrace a world conference on mineral resources and mining engineers and those connected with the mineral industry will be invited from all over the world to attend the New York session in March. The presence of so many foreign scientists and engineers and the large number of members of the Institute have led the board of directors to decide to hold during the same week the annual meeting at the Hotel Waldorf Astoria. The world conference on mineral resources will open Monday morning, March 17, and will close with the banquet on Wednesday night, March 19, 1947. The technical sessions for the annual meeting of the Institute will be held the following Thursday through Saturday, inclusive.

L. E. YOUNG
Consulting Engineer
Mine Mechanization
Mine Management
Oliver Building Pittsburgh, Pa.

PETER F. LOFTUS
Consulting Engineers
ENGINEERING AND ECONOMIC SURVEYS, ANALYSES AND REPORTS ON POWER APPLICATIONS AND POWER COST PROBLEMS OF THE COAL MINING INDUSTRY
Oliver Building Pittsburgh, Pa.



I-T-E AUTOMATIC
Reclosing Circuit Breakers

Since they are able to distinguish between high current value loads and short circuits, Type KSA circuit breakers re-close as soon as predetermined line conditions are met. They save production costs in lost man hours, power, maintenance and repairs.

KSA unattended substation circuit breakers provide automatic or semi-automatic protection and control for m-g sets, mercury arc rectifiers and rotary converters.

Get the full story, contact your nearest I-T-E engineering representative or write for Bulletin 2503.

I-T-E CIRCUIT BREAKER CO.
19th & Hamilton Streets • Philadelphia 30, Pa

Central States

Conference on Coal at University of Illinois

The Eighth University of Illinois Conference of Coal Utilization will be held on the U. of I. campus September 17, 18, and 19. Dates were announced by Prof. Harold L. Walker, general chairman, who is head of the department of mining and metallurgy.

Ordinarily held every two years, the conference in September will be the first since 1941, when sessions were discontinued temporarily because of travel restrictions. Attendance in the past has ranged from 200 to 325 and has included representatives from 18 states.

Included on the 1946 program will be sessions on development of coal utilization, storage and handling, coal merchandising, improving heating results, heating new homes, and stoker coal.

Members of the general committee, besides Walker, are: Thilo Best, vice president, Best Coal Company, Chicago; Joseph Hitt, president, Illinois Mining Institute, Chicago; A. O. Dady, chairman, engineering committee, Stoker Manufacturing Association, Bradley; T. O. Gorman, executive secretary, Illinois Fuel Merchants Association, Chicago; K. C. Richmond, editor of *Coal Heat*, Chicago; J. S. Webber, secretary, Indiana Coal Merchants Association, Indianapolis; George Bridges, secretary, Wholesale Shippers Association, Chicago; J. A. Worsham, secretary, St. Louis Coal Merchants Association; Lynn Spring, Koppers Coal Division, Eastern Gas and Fuel Associates, Chicago; and Howard Herder, fuel engineer, Sahara Coal Company, Chicago.

Lead-Zinc District Covered by Bulletin

Bulletin No. 116, published by Illinois State Geological Survey, has just come from the press. This bulletin, written by H. B. Willman, R. R. Reynolds, and Paul Herbert, Jr., is entitled "Geological Aspects of Prospecting and Areas for Prospecting in the Zinc-Lead District of Northwestern Illinois." This bulletin is an excellent guide for those interested in prospecting the region near Galena and a thorough discussion is given of geology and the problems involved when prospecting by drilling in this area. The various mines in the region are also listed and considerable data is given on their operation. Two maps in black and white are included with the bulletin.

Jeeps Have Use in Mines

Actually, two jeeps are in salt mines, operated a quarter mile below the streets of Detroit by the International Salt Company. Employed as personnel carriers and as light utility trucks, these civilian jeeps have been in the mines continually since last winter. Gasoline and lubricants are brought down to them regularly in the tunnels, which begin under 12841 Sanders Street, Detroit. The jeeps have been serviced underground since the day they were lowered carefully down a 1,140-ft. vertical mine shaft only 6 in. wider than themselves.

Carrying seven miners at a time in seats installed lengthwise, they cruise over a route that extends through about one mile and a quarter of the major tunnels. Where passageways are widest, the jeeps sometimes make speeds of 18 miles an hour. Passenger business gets heaviest when shifts change and then the jeeps shift to four-wheel drive and tow trailers that accommodate 20 miners apiece. As utility trucks, they do odd jobs, running errands and carrying mining tools. The salt company says other passenger equipment wore out, but these civilian half-brothers of the war jeep chug away regularly, taking this newest—and deepest—chore right in their chunky stride.

Do my eyes deceive me or is that John L. Lewis!

Old Town Comes to Life

The ghost town of White Pine in Ontonagon County has been revived by modern mining methods. For the last 25 years this town has been practically deserted. With the reopening of the White Pine mine the cobwebby homes and unpainted buildings are stirring with activity as 50 miners and their families, technicians, and engineers arrive to start a program of restoration and repopulation.

Old shafts will be pumped free of water to permit the extraction of sulphide copper ores and a service shaft is being sunk nearby. A flotation plant at Freda will mill ore from the property.

A new store, gasoline station, garage and service building will be constructed. Assuming all goes well, it is expected that White Pine will become a model community with gardens, cement walks, a fine civic building and other innovations serving a new population in what was once a forgotten wasteland. A company spokesman has stated that "this may be the forerunner of mining elsewhere in the copper country where closed properties give promise of profitable operation under new and improved methods."

Pennington Iron Mine Resumes Production

Early in July the Dates Mining Company resumed production from the Pennington iron mine, near Crosby, Minn., on the Cuyuna iron range. This mine was leased in 1945 from the Shawmut Company. This particular operation has made history. It was the first mine operated in the Cuyuna range by open-pit method. In 1913 the mine was opened by the Tod-Stambaugh Company and made a shipment of 101,136 gross tons of ore.

Charleson Operating on Two Shifts

The Charleson Iron Mining Company is operating by shovel and truck on the leased Missabe Mountain open-pit iron mine at Virginia. The Charleson Company has operated on

this property under lease since 1943. The ore is delivered by truck at the receiving end of conveyor belt system in the pit and is transported 915 ft. to the pit bank, where there is a railroad loading pocket on the ground level.

Zinc Lead Concentrator for Sale

WIS.

A Government-owned ore concentration plant near Platteville, Wis., has been offered for sale or lease by the War Assets Administration. This plant is designed for the complete production of lead and zinc concentrates by flotation from tailings, the installation has an input capacity of 450,000 tons per year.

Leased and operated by the United Milling and Mining Company, the plant consists of two main structures on a 4½-acre site. The mill building measures 50 x 90 ft. and contains approximately 6,100 sq. ft. of floor space. The office and laboratory building is 25 x 24 ft. containing 600 sq. ft. of floor space. Minor structures include a transformer station, ore bin, conveyor, pump house and water reservoir.

Half Year Coal Production Down

IND

Due, in the main, to time lost as a result of the strike in April and May of this year, the state is short on its production for the first six months of 1946 as compared with the same period of 1945 by 2,932,000 tons. Compared with the same six months of 1944, the loss in tonnage is 3,693,255; total production for the first half of each year being 12,702,096 tons in 1944, 11,940,859 in 1945, and 9,008,841 in 1946. Forty-two coal mines in the state produce 90 per cent of the state's tonnage, according to the Coal Trade Association of Indiana.

Facts on Shutdown Outlined by Bilharz

TRI-STA

O. W. Bilharz, of Baxter Springs, president of the Tri-State Zinc and Lead Ore Producers Association, outlined on July 13 the facts concerning the shutdown of the Tri-State mining industry. A portion of Mr. Bilharz's statement is given as follows:

"In the first place, there is no concerted action on the part of the operators to close the field down, but each one individually has been forced to suspend his operations because he cannot continue to operate at a loss for any length of time," he declared.

"When the price of one's product is cut in half and the biggest half is taken away from him over night, it is impossible for the operator to adjust his operations with no assurance that he will be compensated for in doing so.

"During May, operators generally raised the hourly rate of pay of their employes, ranging from 12½ to 18½ cents an hour, and by far the highest in the history of the area, with the assurance of Federal agencies that this increased cost would be taken care of by adjustments in the premium quotas. In very few instances were these adjustments forthcoming, and, before they could become effective in most cases, the whole premium system came to an end abruptly with the expiration of OPA.

"In terms of concentrate prices, the average price with the premiums during the first five months of the year was around $111 a ton for blende, and, with the open market price normally quoted at only $50, there are very few, if any, companies

Parmanco
MECHANICAL FEED
HORIZONTAL DRILL.

Heat-treated gears are used in this transmission and spur gear reductions, with an ample factor of safety for the operation of machine under all conditions. Link-Belt bearings of extra size are used throughout. Augers are connected to main drive shaft through a self-aligning chuck of ample size, in which is secured the drive shaft by two shear pins which provide sufficient safety to rest of machine. The machine is raised or lowered to a height of 36 inches by jacks on front of machine, and rear of machine is mounted on two pneumatic-tired wheels which also have a 36-inch range of adjustments. The machine permits the drilling of a controlled-angle hole, which makes possible a great saving in the use of explosives through the cantilever effect of this controlled-angle drilled hole.

PARIS MANUFACTURING COMPANY
PARIS, ILLINOIS

that can meet the increased wages and other existing high costs of a hazardous industry. Those few that do will have to do highly selective mining to bring up the tenor of their ores, and as to the tailing plants retreating tailings it is inconceivable that they could profitably operate with a zinc recovery averaging about four-tenths of 1 per cent. The premiums on ores from the Tri-State have been running around $1,500,000 a month. With this terrific loss of revenue, how can the operators of the field as a whole sustain their operations?

"Until such time as immediate action is taken, either restoring the premiums for a temporary or more or less permanent period, most of the operators can only stand by marking time, while some 6,500 miners are idle, communities lose thousands of dollars in pay rolls, and the economy of the nation loses large quantities of important metals and their useful fabrication.

"In the meantime, plants and equipment deteriorate and the mines cave and fill with water, and, if some operations in certain cases are carried on, pillars must be pulled to bring up the grade of the ore—none of which is conducive to the best mining practices of a profitable operation.

"One thing that cannot be emphasized too strongly is the matter of conservation of the remaining ore reserves in this district, which is one of the chief reasons for restoration of the premium system at this time. Our domestic requirements must be met largely from present producing areas until the time when the industry can again augment its reserves. The industry in order to assume the risks involved should have some assurance that foreign zinc ore and metal imports will not be permitted to disrupt our domestic market—shutting down our own mines and losing their productive capacity while subsidizing foreign mines and foreign labor."

Antimony Mine to Resume Operations

A new headframe has been completed and a mine hoist installed at the Ozark Mineral Company's operations at the Poorboy antimony mine, near Gillham, Sevier County. Unwatering operations have started and an electric power line has been constructed to the mine. Charles Spencer, who was formerly employed by the U. S. Bureau of Mines and is a former operator in the antimony district, is in charge of operations. As soon as the mine has been dewatered it is anticipated that production will get under way.

HOLMES

ALL-STEEL

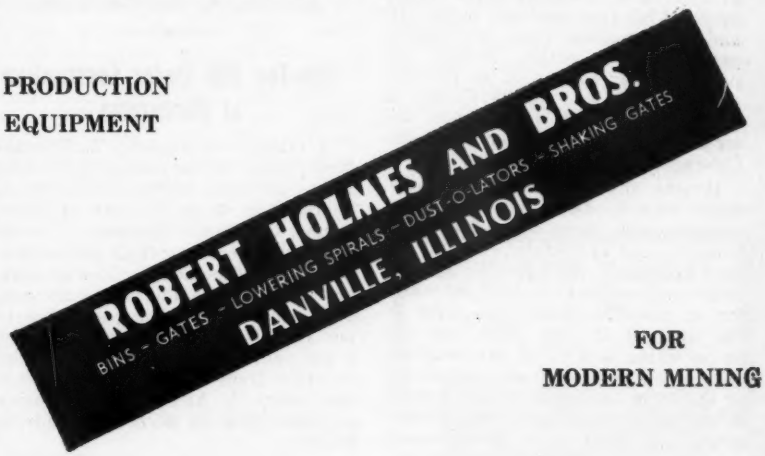
CAGES

In HOLMES design all operating mechanisms have been simplified as far as possible, both to eliminate dead weight and reduce the percentage of delay from failure of some gadget to function properly. All operating parts are arranged for quick change with ordinary tools.

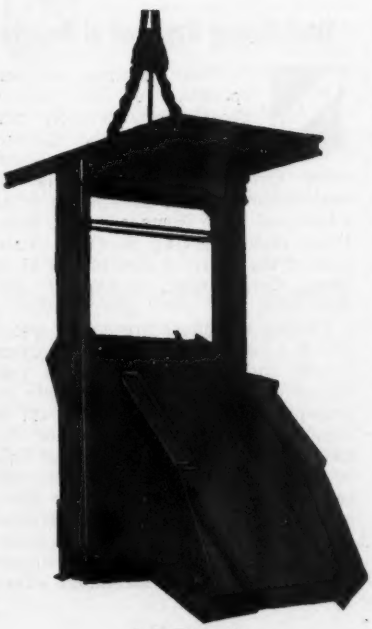
Overturning Type Cage for Use With Solid End Cars

The car lock requires no special attachments on cars. It is also adapted for use with any of the standard automatic cagers.

PRODUCTION EQUIPMENT



FOR MODERN MINING



Self-Dumping

In designing HOLMES all-steel, self-dumping cages, first consideration is given to proper distribution of the load, so that side sheets are relieved of excessive strains and the weight is transmitted directly to the lower bail members. The vertical side members of the bail are one piece rolled sections securely tied together on top and bottom by two pairs of channels. Corner joints of these members are made on machine fit steel gussets having shear lugs extending over the channels to relieve shear on the riveting. Assembled, the bail forms an integral unit landing on only two points in the sump with the corner gussets capable of supporting the weight in case of misalignment of sump timbers.

Western States

Colorado Labor Peace Act Invoked

Although international, district and local officers and members of a coal miners' union (UMWA) at the mines of the Pike View coal property near Colorado Springs, Colo., caused a six weeks' shutdown of the mines beginning April 1, they encountered a Tartar in the mine's lawyer, David P. Strickler. From a life rich in the experience of years, Dave believes most thoroughly in observance and enforcement of the law as he finds it spread upon the statute books of his free mountain state. He and his associate, Thos. M. Burgess, promptly filed notice, motion and complaint for injunction in the District Court, in and for the County of El Paso and State of Colorado, and secured a restraining order under the Colorado labor peace act.

It was charged that the miners, from John L. Lewis on down, "did conspire and agree to wilfully, maliciously, and unlawfully call and put into execution, on April 1, 1946, a strike and walkout of all of the workers at the Pike View coal mine of the plaintiff . . . did walk out and go on strike, and all of said workers have continued and are continuing at this time to engage in and remain in an unlawful, illegal walkout and strike. . . . That as a direct result . . . no coal is being or can be mined, produced, handled or processed, all to the great financial damage and detriment of plaintiff, and to the damage and detriment of the citizens of Colorado Springs and the surrounding territory." It is also charged that the mine workers and their officers were continuing to make the illegal strike and walkout effective by aiding, abetting and advising the workmen to remain on strike, and enforcing the same by intimidation, threats of bodily harm and suggestions of reprisals against the employes and their families.

The court acted promptly by granting the restraining order and the mine resumed operation in mid-May with about one-third of its employes. The Pike View property has always paid wages equal to and higher than the prevailing wage in adjacent coal fields in the region.

The coal mine operators in other states did not have a Labor Peace Act to aid them in their recent negotiation with the UMWA and thus found it necessary under the circumstances to get along as best they could.

For Sale

BALL MILL—40 tons daily capacity; complete with classifier, Denver Jig, assayer's outfit, flotation crusher mill, 15 motors, scales, etc. Price $12,000, or make offer. Also one new Wallberg Gravel Pump.

SIERRA SUPPLY COMPANY
Sonora, Calif.

Telephone Ed Stanley at Sonora 2097

Fifty-Ton Mill Under Construction at Montezuma

A famous old property in Colorado first located by the late U. S. Senator Henry M. Teller in the 1860's is being operated by J. E. Bennett, of Silver Plume, on Glacier Mountain, 2 miles out of Montezuma. This property is the old Chatauqua mine and at present Bennett is building a 50-ton mill. The crude ores running roughly 15 per cent lead, 25 ounces silver, and 2 per cent copper. The vein varies in width from 3 to 4 ft. High-grade ore, which is hand-sorted, is being shipped direct to the Leadville Smelter.

Steel-Making Resumed at Geneva

"The effective post-war operation of the Geneva Steel Plant, recently purchased from the Government by the United States Steel Corporation, came closer to realization with the blowing in of an additional blast furnace at this large Utah plant," Irving S. Olds, chairman of the board of directors of U. S. Steel Corporation, announced last month.

Placing this blast furnace in operation is a part of U. S. Steel's program to get the Geneva plant back into the production of steel products as promptly as possible so as to aid in supplying the heavy demands for steel in the Far West. For the time being the plant at Geneva, Utah, will be operated by Geneva Steel Company, the same subsidiary of United States Steel Corporation which operated the plant for the Government during the war. A strenuous effort is now being made by Geneva to reassemble quickly a competent operating organization.

Dump Ore to Be Milled with Spiral Concentrator

Crews reportedly in the employ of the Pacific Bridge Company of San Francisco are preparing the ground below Park City for treatment of the zinc-lead tailings with spiral concentrators which have been used successfully on this type of operation. Preliminary operations at Park City have indicated a large tonnage available for these purposes. Recent experimental work on Park City tailings with a spiral concentrator at the Salt Lake Station of the U. S. Bureau of Mines is said to have resulted in a satisfactory concentrate.

Ghost Town Active

Mining activities have been revived at the New Mexico ghost town of Bland, west of Albuquerque in the Jemez Mountains, because of discovery of a substance known as "tuff." Half a century ago, during the gold-silver boom at Bland, "tuff" was considered valueless by miners. More than 50 claims have been staked out in Bland and Cochiti Canyons, according to G. L. Wang, Santa Fe National Forest supervisor, and 10 or 12 are already being worked. "Tuff," incidentally, is a volcanic tufa which is mixed with cement and sand to make hollow building blocks, now being used extensively in construction throughout the United States.

Lease Secured on Fluorspar Group

The War Assets Corporation has approved a two-year lease of the Los Lomas fluorspar processing plant of the Zuni Milling Company, which operated it during the war. The plant produces acid-grade fluorspar. The Zuni Company operates fluorspar properties located 14 miles southwest of Grants in Valencia County. The Zuni concern is a subsidiary of the Shattuck Denn Mining Company.

Pearlite May Be Important Resource

Alva H. Gunnell, Albuquerque mining engineer, predicts that New Mexico may have a definite future in the development of its non-metallic natural resources. He especially cites "pearlite," of which he already has shipped a carload from his Bear Springs property 20 miles west of Domingo, N. Mex. "Pearlite," Gun-

nell says, is a volcanic glass which can be used—after processing—for insulating materials. Also, Gunnell plans to develop a "Ramsey Kakolinite" deposit in the Black Range Mountains, in southwest New Mexico. This is a rare clay used in manufacturing high-grade ceramics.

San Manuel Ore Body May Become State's Biggest Discovery Since '10

ARIZ

The San Manuel ore body is apparently one of the biggest strikes in Arizona's copper mining history. It is smaller than the Phelps-Dodge Morenci deposit, estimated at 450,000,000 tons of ore, but it is larger than the Miami Copper Company's wartime Castle Dome development, which has an estimated reserve of 25,000,000 tons. To date exploration drilling has indicated the San Manuel deposit contains at least 100,000,000 tons of low-grade ore.

The Magma Copper Company began exploration on this property in December, 1944. U. S. Bureau of Mines surveyed the deposit and reported that it contained an estimated 30,000,000 tons of ore. On the basis of this report the Magma Copper Company obtained a purchase option from the four men who had discovered the property in August, 1944, and since that time has been working on a diamond-drill project.

Although Magma is the sole developer of the San Manuel deposit, Anaconda Copper Mining Company has leases northeast of the main property.

Up to July 15 Magma had completed 60 exploratory drill holes at an average cost of $20,000 a hole. Samples were taken every 5 ft. from the surface to the lowest depth of 2,600 ft., and these samples have shown an average copper content of only 0.79 per cent for the 100,000,000-ton ore body. Considering that all copper ores produced in the United States in 1940 yielded an average of 1.2 per cent copper per ton, obviously this is a low-grade deposit. The success of this project from now on will depend upon San Manuel's ability to crack the metallurgical problem of handling this low-grade ore.

Large Lead-Silver Orebody Located

IDAHO

The Silver Bowl Mining Company has discovered what is apparently a major sized lead-silver orebody in ground formerly owned by the old Senator Stewart Mining Company, control of which was purchased by F. Aug. Heinze, of Butte, in 1910. From that date until 1914 Heinze produced out of the Stewart vein 164,000,000 lbs. of lead and 8,000,000 ozs. of silver, and declared dividends totaling $2,692,747. The orebody exploited by Heinze terminated on what is known as the New Era fault and in its downward course raked into the Ontario claim, which belonged to another company. Heinze made no attempt to pick up the vein east of the New Era fault, and the mine has remained idle since 1914. In recent years the property was purchased by the Silver Bowl Company, who have located the eastern segment of the orebody with a small amount of development work from a point in the Fir tunnel, where Heinze's miners had crossed the vein in a lean spot.

The Silver Bowl Company drifted about 100 ft. in lean ore, but finally broke into a virgin ore shoot which carries 3 ft. wide of lead ore averaging 58 per cent lead and 10 ozs. in silver per ton, together with 6 ft. wide of high-grade milling ore.

The Silver Bowl Company owns 1,300 ft. on the strike of this vein, all of which is in virgin ground between the New Era and Osburn faults. The company is now mining the high-grade portion of the vein for shipment to the Bunker Hill smelter, which plant is located only a short distance from the portal of the Silver Bowl workings. The Stewart claims adjoin the Bunker Hill mining property, and is also the adjoining property to the old Caledonia mine, which was a parallel vein, and which produced $4,923,129 in dividends.

Fire Loss to Be Replaced

NEV.

Two mills and the roasting plant of the Nevada Scheelite Mining Company, which were burned the middle of June, are expected to be rebuilt at the mine site six miles distant, providing water can be raised to higher elevation at this tungsten property. The loss was estimated at $100,000. Fire started on oil-soaked floors and the three buildings were destroyed in two hours.

Work Being Pushed at Goldfield

Operations on Red Hills Florence ground in Goldfield are reported progressing rapidly. Machinery purchased from the Jumbo Extension mine has been put in position, a new hoist house and compressor building erected and workmen are installing a new power line. Active shaft development is also under way and work in deep levels is expected to be reached in a few weeks.

School of Mines to Revise Curriculum

MONT.

An exhaustive reconversion study of curricula, teaching methods and laboratory practice has been completed at Montana School of Mines and unanimously adopted by the faculty, following nearly a year's work by more than 500 keenly interested people. The purpose is to bring Montana School of Mines up to the minute in all departments including addition of a course in petroleum engineering and to make the most of technological advances brought out during the war, applicable in the mineral industry.

Under the leadership of Dr. Francis A. Thomson, president, the reconversion plan was started in October, 1945. It was presented first to a committee of 27 which comprised members of the faculty, students and alumni. As the study progressed more people became interested until it finally included more than 500. This group comprised not only leaders in the industry from the "Mines" and other technical schools, but former faculty members including Dr. A. M. Gaudin, Richards Professor of Mineral Dressing at the Massachusetts Institute of Technology, and other former Mines faculty members and graduate students at that school.

MOVE MORE MATERIAL

With { less labor / lower costs!

SAUERMAN

SCRAPER SYSTEM

ONE MAN does all the work of a squad! Digging, hauling and automatic dumping of any bulk material become one continuous operation, entirely controlled by one operator. Wide range of handling capacities and operating spans.

Send for Catalog

SAUERMAN BROS., Inc.

540 S. Clinton St. Chicago 7, Ill.

Deal Completed for Musick Mine

The Tar Baby Mining Company, Salt Lake City, has purchased the Musick mine situated in the Bohemia mining district of Lane County, Oregon. Approximately $1,000,000 worth of ore has been shipped from this property in the past. Two ore bodies are partially developed below the tunnel level by a winze some 67 ft. in depth. Each of the ore bodies is approximately 200 ft. long and from 4 to 5 ft. wide and partial development has indicated that further work should bring into sight about 40,000 tons. The ore is a gold-silver-lead-zinc-copper sulphide assaying from $30 to $45 per ton with perhaps half of the value being in the gold. The Tar Baby Mining Company does not intend to operate this property until some arrangement can be made for milling the ore at a point closer than Salt Lake City. Owing to the high cost of transportation for milling purposes from western Oregon to the Utah plant, it seems best to wait until plans can be completed for a mill in the Bohemia district.

New Shaft Sunk on Siskiyou Property

The interests of R. B. Hall of Medford and W. E. Samuels of Ashland have been acquired by E. Stuart Cosgrove and Albin A. Carlson of San Francisco. This new group has become active in the Last Chance gold operation located 13 miles west of Hilt in Siskiyou County. A new shaft has been sunk 50 feet, and with the bunkers full of ore, all trial mill runs have been completed. Eight men have been employed in the preliminary work and with production in full swing it was planned to run two shifts with 15 men. Lloyd B. Peters, formerly of Montana, and Edwin A. Ritter are in charge of underground work, with Arthur Pacheco supervising maintenance. Archer Browse, formerly a placer mining man from Calaveras County, Calif., is in charge of production and personnel. The plant has a capacity of 50 tons and was operating until shut down by the gold order during the war.

Mining Stampede Reported

Of Klondike proportions, a veritable '46 model mining stampede is the onrush and staking out of claims, shoulder to shoulder, on Silver Creek. Upon this creek of the Entiat River more than 150 men and women are burning with a new mining fever—but the "ore" near the surface is pumice. . . .

Airplane usage has put a new premium on pumice extraction and makes it real "pay dirt." It has become a prime insulating material in the B-29 Superfortresses, and similar large transport plane fuselages. Pumice is also pressed into sheets and handily used in roofing asphalt, another new industrial use of the day. Finally, it can be poured loose into the walls and floor space of the many cold storage plants which are increasing in number with the urge for quick-freezing and locker setups.

There is a stretch for 15 miles on the upper part of Silver Creek that has been thoroughly staked off in the unprecedented pumice mining rush that follows a Klondike pattern—for pumice has become the most mined and most valuable mineral asset in the hills and earth of the state of Washington at present. Considerable quantity of this pumice is being scraped out of open workings or mines by the amateurs by bulldozers. This has made pumice the "hottest mineral in the state," in the parlance of droves of new miners.

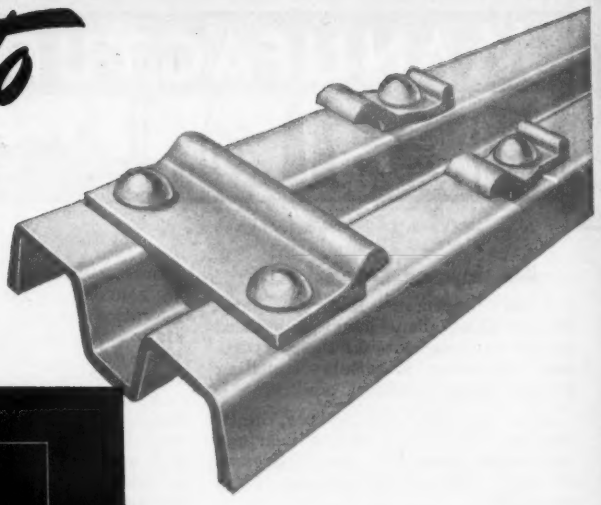
IN OPEN-PIT OR UNDERGROUND IT'S EASIER and QUICKER to TAMP WITH BAGS

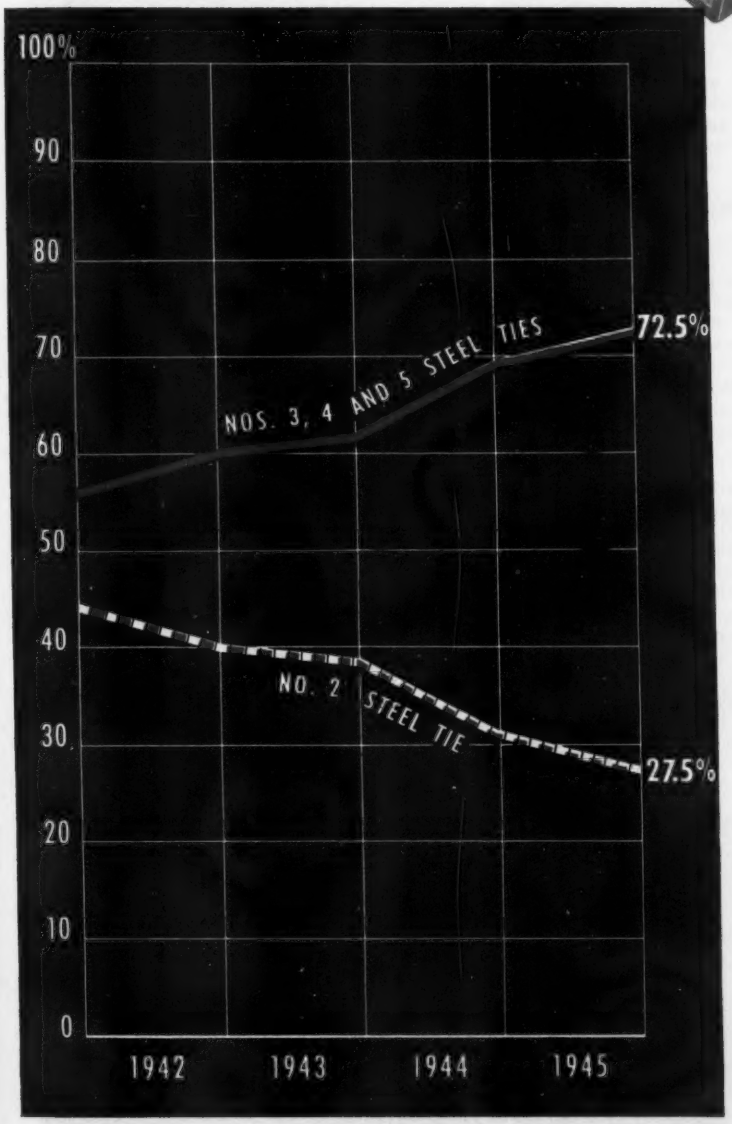
Visit our Booth No. 226 at the Metal Exposition for full information on the new moisture-proof SEAL-TITE BAGS

To prove that SEAL-TITE BAGS give a better tamp . . . that they increase safety . . . keep fumes and smoke to a minimum . . . decrease the amount of explosive and still increase production . . . the Tamping Bag Company will furnish FREE samples—to make your tests. Write for them now.

TAMPING BAG COMPANY
MT. VERNON, ILL.

The Swing is to HEAVIER STEEL TIES





Sales of Bethlehem No. 2 steel ties compared with sales of the heavier 3's, 4's, and 5's. Reckoned on percentage basis.

In 1941, the light No. 2 was our most popular weight. Even combined, the sales of the other three weights did not greatly exceed those of the No. 2 alone.

But look at what happened during the next four years. At the end of 1945, the combined sales of the heavier ties were more than two and one-half times as great as those of the light No. 2's.

We suggest that mine operators study this chart carefully. It shows the trend in the use of Bethlehem steel mine ties for the years 1942-1945 inclusive.

The No. 2 tie is our lightest, weighing 2 lbs. per ft. Nos. 3, 4, and 5 weigh respectively 3, 4, and 5 lbs. per ft. As you look at the chart, you can't help noting how the heavier group (consisting of 3's, 4's, and 5's) has dominated the sales picture during the last few years.

Mine operators are learning that it pays to install heavier steel ties—ties that will stand up under the crushing weight of motors, cutters, and loaders. Steel ties mean long-term economy in today's highly-mechanized layouts. And under many conditions, the heavier ties do the best, most economical job of all.

Ask a Bethlehem man for full details.

BETHLEHEM STEEL COMPANY

BETHLEHEM, PA.

★ BETHLEHEM STEEL ★

MANUFACTURERS FORUM

New, Improved Hydroseal Pump

Allen - Sherman - Hoff Company, Philadelphia, Pa., have announced recent improvements in their Hydroseal Abrasive Materials Handling Pump. These include:

New bearings—Heavy-duty, antifraction radial and thrust bearings are now standard on Hydroseal Pumps. These bearings are interchangeable.

New axial adjustment—The pump is now provided with a new, improved means for easy, two-way axial adjustment of the shaft and bearing assembly.

New pump shell—No rigid mounting of pump shell or engine side bell to pump base. Both are now supported from the bearing housing. This permits pump discharge to be placed at any of the three positions indicated above. In many cases, this will simplify installation of discharge piping; further, it eliminates "special pump" construction to obtain this result.

The maintained high efficiency and the low maintenance costs achieved by the Hydroseal principle and Maximix rubber pumping parts remain the same, because the inside construction of the pump itself is unchanged.

Blueprints will be sent on request, until new catalog, now in preparation, is completed.

Simplified Pressure Lubrication

Loading of hand guns, long a vexing and often wasteful problem to users of pressure lubrication systems, has been resolved into a simple, clean, quick operation by new equipment just announced by the Alemite division of Stewart-Warner Corporation, Chicago.

A new "gun-loader fitting" which is mounted on the head of a hand gun and permits grease to flow INTO the grease reservoir of the gun in the same manner that it flows into a bearing through a lubrication fitting in normal lubrication, is the key innovation of the new gun-loading system. A loader valve mounted on a bucket pump or loader pump, functioning in the same manner that a coupler does when applied to a fitting, is the companion item to the loader fitting on the hand gun.

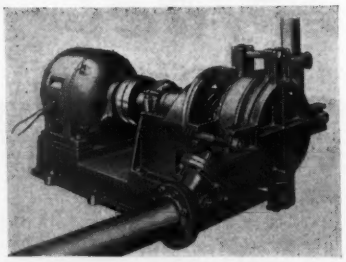
In addition to the new guns and pumps, a loader valve, No. G-306740, to convert present guns to loader operation is available. It can be installed in either lever type or push type guns simply by drilling and tapping ⅛-in. pipe thread.

A loader kit, No. G-306910, containing all necessary parts to convert any bucket pump into a loader, and including one loader fitting for a hand gun, is also available. A bracket to hold a gun on the side of the bucket is also included in this kit.

Morris Machine Offers New Pump

Morris Machine Works, Baldwinsville, N. Y., has just placed on the market their new Type R Slurry Pump. It is furnished in 2-in., 3-in., 4-in., 5-in. and 6-in. sizes.

This unit handles all types of mixtures containing abrasive solids and chemicals in suspension, including



acid slurries and sludges, caustic liquors, milk of lime; also slurries containing soda ash or concentrates, tailings, slag, residue from filters and classifiers, coal, silt, washery solids. It is said to be especially adaptable for handling cement and glass sand slurries.

Full information will be furnished upon request to the company.

Marion Presents the 111-M

Marion Power Shovel Company of Marion, Ohio, announces a new 3½-4 cu. yd. machine—the Type 111-M—for heavy-duty service in mining, quarrying, stripping and general construction.

The 111-M fills a long-felt need for a Diesel-powered machine in this size which can be readily shipped without major dismantling and quickly convertible to dragline or clamshell service. The machine has a balance of power, weight and dipper capacity to meet the requirements of heavy-duty service in pit or quarry work.

It is of all welded construction with a balance in design providing for low center of gravity, making the machine stable under all digging conditions. Particular care has been given to the requirements in heavy-duty service for speed, power, ease of control and maneuverability. Variable crawler widths and lengths are offered, making the machine adaptable to individual job requirements.

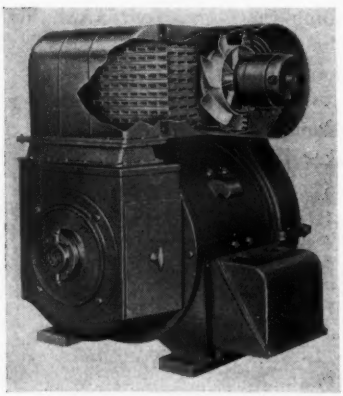
The Type 111-M is quickly convertible to dragline, clamshell, or crane service.

The 111-M requires only a minimum of preparation for rail shipment. Insert shows the shovel in action

G-E Announces New Line of Unit-Cooled D-C Motors

A new line of unit-cooled, totally-enclosed, direct-current motors especially designed for operation in severe atmospheric conditions such as prevail in steel mills, cement and paper mills and coal and coke plants, has been announced by the General Electric Company, Schenectady, N. Y. The new motors are available in sizes 15 to 200 hp. at popular speeds and voltages.

A unique feature of the new line of motors is the dual ventilating system, which utilizes a compact unit cooler operating on a principle similar to that of an automobile radiator except that air instead of water is used for cooling. The unit cooler has two sets of air passages arranged at right angles to each other. A fan on the armature circulates air through the motor and through one set of passages, forming a completely enclosed system. External air, maintained at a constant rate of flow by an auxiliary motor and fan, travels



through the other set of passages to absorb heat from the enclosed system. By utilizing this principle, a totally-enclosed construction is achieved without external duct work, piping, air filters or pressurized air supply.

A thermostatic relay located in the airstream of the enclosed system protects the main motor in case of failure of the auxiliary motor power supply or accidental restriction of the air intake. Installation of the unit-cooled motor is as simple as the conventional open dc motor, since the unit cooler is completely assembled and mounted on the main motor at the factory.

Maintenance is reduced by the enclosed construction of the motor, which protects vulnerable current-carrying parts from injurious airborne materials. Even though completely enclosed, however, vital parts of the motor are accessible for periodic maintenance and inspection.

The new motors can be furnished with either ball- or sleeve-type bearings, depending upon service requirements.

Further details about the new line of motors are given in GEA 4469.

— *Announcements* —

Announcement is made that **Robert W. Ward** has been elected a vice president of American Car and Foundry Company and placed in charge

ROBERT W. WARD

of manufacturing. Mr. Ward was previously district manager of the ACF Huntington, W. Va., plant. He will make his headquarters in New York.

W. E. Lunger, general superintendent of the ACF Huntington, W. Va., plant, has been appointed district manager of that plant.

Tom Hallinan has rejoined E. D. Bullard Company, manufacturers and distributors of industrial safety equipment, as sales representative in the company's Los Angeles office, 1213 So. Olive Street. Hallinan was formerly branch manager for Bullard at Denver, and returns to the company after military service.

* * *

E. C. Low, vice president in charge of sales, John A. Roebling's Sons Company, Trenton, N. J., announces the promotion of **Forest S. Burtch** to manager of sales, wire rope division, and **William Hobbs, Jr.,** to manager of sales, aircord division.

* * *

The appointment of **C. W. Hagenbuch** to Assistant Vice President was recently announced by J. C. Shepherd, Executive Vice President, Sheffield Steel Corporation.

Mr. Hagenbuch has been associated with Sheffield since 1920 when the firm was then known as the Kansas City Bolt & Nut Company.

New "Liberty" Ratchet Drill-Driver

Development of the New Liberty Ratchet Drill-Driver is announced by Techtmann Industries, 714 W. Wisconsin Ave., Milwaukee 1, Wis., national distributors—manufactured by the Liberty Tool & Machine Co.

Designed for drilling between studs and joists or restricted spaces in buildings or other structures, this tool gives positive feed at each turn of the drill bit. The compact head allows centering of holes within 1¼ in. of the nearest obstruction. Any standard wood bit can be used. Steel drills can be used with an adapter chuck.

The ratchet is fully enclosed in a strong, semi-steel head, providing protection against dirt. A long lead screw in combination with 1-in., 2-in. and 8-in. extensions allows use of the Ratchet Drill-Driver over a wide range of dimensions. In actual use, holes up to 3-in. diameter have been drilled without difficulty.

Although intended primarily for use on wood members, steel plates or beams can also be drilled by reducing the feed, which can be done by revolving the lead nut in the same direction as the drill.

Plant to Expand

The Allis-Chalmers Manufacturing Co., of Milwaukee, has announced a $50,000,000 expansion program. Plans are underway to expand manufacturing and sales facilities and the company's tractor division plant at Springfield, Ill., and La Porte, Ind., are to be enlarged as well as the general machinery works at West Allis, Wis., and Norwood, Ohio. The company estimates that a minimum of $17,000,000 must be spent at the tractor plants alone and $10,000,000 on the general machinery works. Such expenditures are expected to improve working conditions, result in lower costs, improve production of existing products and to provide facilities for manufacturing new products.

Magnetic Drill Extractor

Dings Magnetic Separator Company, Milwaukee, Wis., is marketing an ingenious magnetic extractor for removing broken detachable bits and steel from drill holes. The device consists of a permanent Alnico magnet which can be attached to a length of drill rod. The rod is then inserted into the hole containing the broken rod or bit and it is claimed that the magnetic extractor effects recovery of the broken portions. Made in two sizes, 1¼ and 1½-in. diameters, the extractor can be carried in the pocket. This device is said to be of considerable value when "fishing" for lost or broken diamond drill bits and its use does not require great skill or special equipment.

CORE DRILLING

ANYWHERE

We look into the earth

PENNSYLVANIA

DRILLING COMPANY

PITTSBURGH, PA.

ROBINSON

VENTILATING COMPANY

•

Fans and Blowers

Ventilating Engineering Service

•

ZELIENOPLE

PENNSYLVANIA

Established 1902

HOFFMAN BROS. DRILLING CO.

CONTRACTORS

DIAMOND CORE DRILLING

PUNXSUTAWNEY, PA.

Our specialty—Testing bituminous coal lands
Satisfactory cores guaranteed

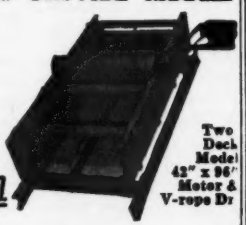
UNIVERSAL SCREENS and UNIVIBE RIDDLES

Vibrating Screens and Vibratory Riddles, in many sizes and types, all priced most reasonably. . . . Tried, Proved and Guaranteed Products. Leaders in Screening Field Since 1919.

Write for Catalog on Screens and Screening

UNIVERSAL VIBRATING SCREEN CO.

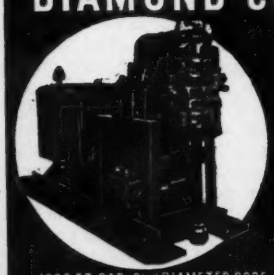
RACINE - - WISCONSIN



Two Deck Model 42" x 96' Motor & V-rope Dr

DIAMOND CORE DRILLING

CONTRACTORS



TESTING COAL AND ALL MINERAL PROPERTIES - USING OUR LIGHT GASOLINE DRILLS.. THEY SAVE FUEL AND MOVING COSTS.. WE GUARANTEE SATISFACTORY AND PROPER CORES..

PRE-PRESSURE GROUTING FOR MINE SHAFTS... GROUND SOLIDIFICATION FOR WET MINE AREAS BY OUR STOP GROUT METHOD. WATER WELLS AND DISCHARGE HOLES DRILLED AND GROUTED... ELECTRIC DRILLS FOR INSIDE MINE DRILLING..

1200 FT. CAP. 2 1/4" DIAMETER CORE

MOTT CORE DRILLING CO.

HUNTINGTON, W. VA.

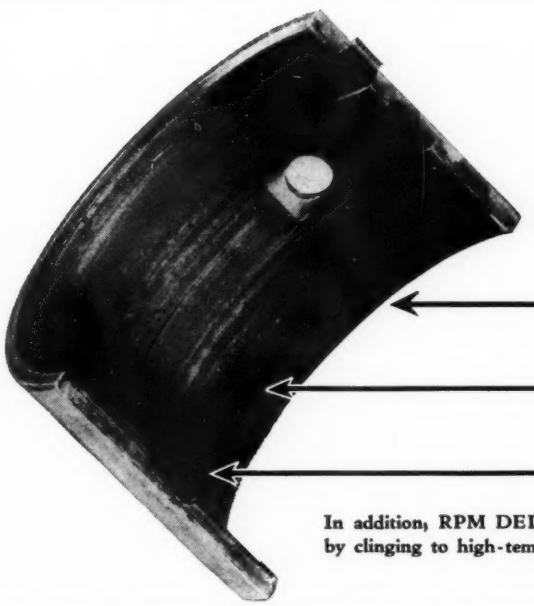
INDEX TO ADVERTISERS

	Page
Alloy Steel & Metals Co.	9
Aluminum Company of America	17
American Car & Foundry Co.	Insert between 16-17
Anderson Co., H. S.	14
Bethlehem Steel Co.	93
Climax Molybdenum Co.	36
Colcord, F. Carl	83
Colorado Fuel & Iron Co., The	31
Colorado Iron Works Co.	35
Cummins Engine Co., Inc.	2
Denver Equipment Co.	34
Edison, Inc., Thomas A.	68
Eimco Corp., The	10-11
Electric Storage Battery Co.	Front cover
Euclid Road Machinery Co., The	69
Gardner-Denver Co.	32
General Electric Co.	18-19, 56
Goodman Mfg. Co.	4-5
Haney, Marshall	83
Hardinge Co., Inc.	7
Hoffman Bros. Drilling Co.	96
Holmes & Bros., The Robt.	89
Independent Pneumatic Tool Co.	15
Ingersoll-Rand Co.	Insert between 16-17
International Harvester Co.	8
I-T-E Circuit Breaker Co.	86
Jeffrey Mfg. Co.	12-13
Joy Mfg. Co.	54-55
Kennametal, Inc.	53
Knox Mfg. Co.	Second cover
Link-Belt Co.	73
Loftus, Peter F.	86
Mack Trucks, Inc.	71
Macwhyte Company	84
Mine & Smelter Supply Co., The	30
Mott Core Drilling Co.	96
Myers-Whaley Co.	70
National Malleable & Steel Castings Co.	6
Nordberg Mfg. Co.	3
Ohio Brass Co.	20
Paris Mfg. Co.	88
Pennsylvania Drilling Co.	96
Roberts & Schaefer Co.	Back cover
Robinson Ventilating Co.	96
Sanford-Day Iron Works	85
Sauerman Bros.	91
Sheffield Steel Corp.	78
Sierra Supply Co.	90
Standard Oil of California	Third cover
Stearns-Roger Mfg. Co., The	33
Tamping Bag Co.	92
Union Pacific Railroad	72
Universal Vibrating Screen Co.	96
Young, L. E.	86
Yuba Mfg. Co.	16

Diesel Engine DANGER points

Alloy bearings corroded by unstable lubricants

The high pressures and temperatures in present-day Diesel engines greatly accelerate oxidation of some lubricants. Under such conditions, these oils tend to become corrosive and attack the lead in the copper-lead structure of alloy bearings. This leaves a porous copper shell which breaks down under pressure. The illustration shows how an alloy bearing looks after operation with an uncompounded oil.



RPM DELO Oil gives bearings 3-way protection against corrosion

1. RPM DELO Diesel Engine Lubricating Oil base stocks are naturally resistant to oxidation, the cause of most lubricants becoming corrosive.
2. RPM DELO Oil is *compounded* to further reduce the danger of oxidation.
3. RPM DELO Oil's oxidation inhibitor gives bearings direct protection against corrosion.

In addition, RPM DELO Oil is compounded to prevent ring-sticking, to reduce wear by clinging to high-temperature areas most oils leave bare, to eliminate foaming.

To match the fine performance of RPM DELO OIL, use these equally efficient companion products from the same famous "RPM" line—RPM HEAVY DUTY MOTOR OIL —RPM COMPOUNDED MOTOR OIL—RPM GEAR OILS AND LUBRICANTS—RPM GREASES. For additional information or name of your distributor, write any of the companies below:

STANDARD OF CALIFORNIA • 225 Bush St., San Francisco 20, California
THE CALIFORNIA COMPANY • 17th and Stout Streets, Denver 1, Colorado
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA OIL COMPANY • 30 Rockefeller Plaza, New York 20

DIESEL ENGINE RPM DELO LUBRICATING OIL

Coal Economy

...is achieved through the use of SPECIFIC GRADES

Crucible Fuel Division, Crucible Steel Company of America, Crucible, Pennsylvania, uses two 48" R & S Hydro-Separators, two 7' and one 20' R & S Hydrotators to produce processed coal for metallurgical use at the rate of 400 tons per hour.

Run-of-mine capacity is 500 tons per hour. Raw coal screen-sizing, hand picking and crushing of the plus 4" material proceeds at this rate until 4" material is stored in a 2000 ton concrete bin. Further sizing to 4" x 1" and 1" x 3/8" for the coarse coal washing in R & S Hydro-Separators and 3/8" x 0" for the finecoal washing in R & S Hydrotators, is at the rate of 400 tons per hour. The blended and washed coal is reassembled for shipment in river barges or in railroad cars.

WISE COAL CONSUMERS

use the grade of coal particularly adapted to their specific requirements—

SMART PRODUCERS

clean and grade their coal to fit the specific requirements of their customers—or for their own use.

R & S HYDRO-SEPARATORS

Hydrotators—and Stump Air Flow cleaners are designed for better processing to meet these consumer demands. R & S descriptive bulletins should help you. We will be glad to send them to you upon request. Bulletin No. 161—R & S Tandem Hydro Separator; Bulletin No. 162—R & S Hydrotator; Bulletin No. 163—R & S Stump Air-Flow Cleaner.

R AND S COMPANY

ROBERTS and SCHAEFER CO.

307 North Michigan Avenue, Chicago

2221 Oliver Building
PITTSBURGH, 22, PA.

P. O. Box 570
HUNTINGTON, W. VA.